

Operating device for an order-picking apparatus

The present invention relates to an operating device for a commissioning device and in particular to an operating device
5 for a commissioning device with horizontal storage areas for storing piece goods, in particular medicinal packages.

There are numerous operating devices for commissioning devices known from the prior art for automatically storing and retrieving piece goods, in particular medicinal packages.

10 For example, from EP 2 165 950 A1, an operating device is known which comprises a delivery table and clamping jaws disposed thereabove. The clamping jaws are pivotably attached to a top part of the operating device. The top part comprises a guide which is coupled to the clamping jaws. To execute a
15 pivoting motion of the clamping jaws, the guide is moved in the storage and retrieval direction. A disadvantage of the operating device is that it has numerous components which are necessary to execute the pivoting motion, which leads to high costs for the operating device. Furthermore, the design of the guide and the
20 translation of a rotational motion of a drive into the pivoting motion of the clamping jaws means that the jaws can only exert a limited clamping force onto piece goods to be retrieved. In the last few years, however, an increasing number of medicinal packages with larger dimensions and higher weights have appeared
25 on the market such that an increased clamping force has become desirable.

It is the object of the present invention to provide an operating device of simplified design with pivotable clamping jaws for producing higher clamping forces.

30 In the scope of this application, the terms "piece good" and "medicinal package" will be used, wherein these terms will also be understood to include the respective plurals. The operating device according to the invention can be used to store and retrieve a piece good or medicinal package or a plurality of
35 piece goods or medicinal packages simultaneously.

The above object is achieved according to the invention by an operating device with the features of patent claim 1. The operating device according to the invention, for a commissioning device with horizontal storage areas for storing piece goods, in particular medicinal packages, comprises a delivery table with a storage and retrieval side for moving piece goods or medicinal packages from or to a storage area, the table extending in a first horizontal direction (x). The above first horizontal direction corresponds to the storage and retrieval direction for piece goods and is normally identical to the longitudinal axis of the operating device. Two elongated clamping jaws are disposed above the delivery table, the jaws having clamping surfaces facing one another.

The operating device further comprises a clamping jaw guide apparatus with a frame structure and at least one first and one second guide which are in parallel with one another separated at a distance in the first horizontal direction (x), extending in a second horizontal direction (y) perpendicular to the first horizontal direction (x) (the second horizontal direction is thus perpendicular and orthogonal to the storage and retrieval direction).

The operating device itself is disposed on the side of the delivery table opposite the storage and retrieval side thereof. The first guide is defined here as the guide facing the storage and retrieval side. The second guide is disposed parallel and behind said first guide relative to the storage and retrieval side.

The clamping jaw guide apparatus further comprises at least four clamping jaw carriages which are coupled to the guides and driven in the second horizontal direction (y) and movable at the guides, wherein two first clamping jaw carriages are associated with the first guide and two second clamping jaw carriages are associated with the second guide, and wherein at least two clamping jaw carriages are coupled to a respective clamping jaw at a distance from one another in the first horizontal direction (x).

Finally, the operating device comprises a drive unit for moving the clamping jaw guide unit in the first horizontal

direction (x), the drive unit being coupled to the clamping jaw guide apparatus.

According to the invention, therefore, each clamping jaw is coupled to a plurality of clamping jaw carriages, usually to half of the clamping jaw carriages present. The coupling points are offset relative to the first horizontal direction (x) (the storage and retrieval direction) so that for example the motion of the first clamping jaw carriages toward one another in the second horizontal direction (y) effects a tilting of the clamping jaws together when the second clamping jaw carriages are positionally fixed.

In the operating device according to the invention, the control of the clamping jaws is executed very simply and directly by way of the at least four clamping jaw carriages, and no movement of a guide unit in the storage or retrieval direction is required to pivot the tilting jaws opposite to this storage and retrieval direction. Through this direct control using at least two clamping jaw carriages per clamping jaw, higher clamping forces can be applied. For example, it is conceivable to have the at least two clamping jaw carriages per clamping jaw act in concert (by moving the two clamping jaw carriages toward one another relative to the second horizontal direction (y)). Seen from a design perspective, the operating device according to the invention is much simpler, and higher clamping forces can be applied despite this simpler design.

In order to move the clamping jaw carriages in the second horizontal direction (y) at the guides, each clamping jaw carriage can be provided with a dedicated drive unit, for example, the drive unit sitting directly on the clamping jaw carriage. In this way, the at least four clamping jaw carriages can be moved at the guides independently of one another so that the clamping jaws can be tilted arbitrarily open and closed, whereby the two jaws tilt independently of one another.

The example of disposing a dedicated drive on each clamping jaw carriage does, however, come with greater expenses, and higher cabling and control requirements. In a preferred embodiment of the operating device, the clamping jaw guide apparatus comprises at least two drive elements coupled to a

drive unit, wherein a first drive element is connected to the first clamping jaw carriage and a second drive element is connected to the second clamping jaw carriage, wherein the first and the second drive elements are disposed at a distance from one another in the first horizontal direction (x). In this embodiment, the clamping jaw carriages associated with a guide are moved or driven through the use of a single drive element, thereby obviating the need for assigning a single drive to each clamping jaw carriage. The drive elements and the associated drive unit can be designed in any way as long as linear motion of the clamping jaw carriages is assured in the second horizontal direction at or on the guides. To drive or move the clamping jaw carriages, any kind of linear drive can be used. It is preferred that the drive elements be designed to be belt-driven, the belts being redirected at pulleys at the guides and driving the clamping jaw carriages (by way of a coupling to the drive unit), for example; in such an embodiment, the clamping jaw carriages must be designed to include appropriate coupling means.

In order to achieve separate controllability of all clamping jaw carriages, in a preferred embodiment of the operating device the clamping jaw guide apparatus comprises at least four drive elements coupled to a drive unit, wherein two first drive elements are connected to the first clamping jaw carriage and two second drive elements are connected to the second clamping jaw carriage, wherein the first and the second drive elements are disposed at a distance from one another in the first horizontal direction (x). In this embodiment, only one (central) drive unit is provided which is coupled to the clamping jaw carriages by way of the drive elements and which moves the clamping jaw carriages by way of the drive elements at the guides. The drive unit itself can comprise only one drive, which can then be coupled to the drive elements by way of a corresponding transmission unit in order to move said elements individually and/or in pairs.

The drive elements and the associated drive unit can be designed in any way as long as linear motion of the clamping jaw carriages is assured in the second horizontal direction (y) at

or on the guides. Thus, to drive or move the clamping jaw
carriages, any kind of linear drive can be used. In a
particularly advantageous design of an embodiment of the
operating device which is easy to construct, the drive elements
5 are designed as toothed racks and coupled to the drive unit
accordingly. Another advantage of the toothed racks is that high
forces can be transferred to the clamping jaw carriages thereby.

To retrieve piece goods or medicinal packages from storage
areas, it is common to align the clamping jaws in parallel and
10 then move the same into the storage area so that after the
clamping jaws are moved inward the piece goods to be retrieved
are positioned therebetween. In order to grasp the piece goods,
the clamping jaws are then tilted in such a way that the ends of
the clamping jaws moved into the storage areas are moved toward
15 one another. During retrieval, the ends of the clamping jaws can
abut against the sides of the piece goods, or the clamping jaws
can be moved together far enough that the distance between the
ends of the clamping jaws is less than the width of the rear
piece good to be retrieved.

20 Due to the manner in which the piece goods are retrieved,
the clamping jaws don't need to be moved away from one another
separately; a synchronous, mirror-imaged, identical motion of
the clamping jaws is sufficient. Therefore, in a preferred
embodiment, the drive unit comprises at least two drives, each
25 comprising one drive gear, and the first and second drive
elements designed as toothed racks are disposed opposite one
another, wherein one drive gear is disposed centrally between
the first and second drive elements, respectively, so that the
clamping jaw carriages associated with a guide are driven
30 synchronously.

As illustrated above, the clamping jaws must move inward
into the storage area in order to retrieve piece goods or
medicinal packages. Since the clamping jaws are coupled to the
clamping jaw guide apparatus, said apparatus must be movable in
35 the storage and retrieval direction (corresponding to the first
horizontal direction (x)), which is why the clamping jaw guide
apparatus is coupled to a corresponding drive unit.

In order to provide an operating device with as large of an open delivery table area as possible (i.e. with as compact a clamping jaw guide apparatus as possible), in a preferred embodiment a component of the frame structure of the clamping jaw guide apparatus reaches around the delivery table and is coupled to a drive unit disposed below the delivery table, the drive unit moving the clamping jaw guide apparatus. In such an embodiment of the clamping jaw guide apparatus, it is possible to dispose the drive for moving the clamping jaw guide apparatus in the storage and retrieval direction below the delivery table such that the clamping jaw guide apparatus is designed very compactly relative to the first horizontal direction (x).

In a preferred embodiment, which is of a simple design, the drive unit for moving the clamping jaw guide apparatus is designed as a linear drive with moving parts and stationary parts, wherein the moving parts are coupled to the component of the frame structure that reaches around the delivery table, and the stationary parts are designed below the delivery table.

To move piece goods or medicinal packages placed on the delivery table from the same to a storage area, the operating device usually comprises a pusher, which can be designed as a telescope arm, for example, wherein this pusher can be coupled to the clamping jaw guide apparatus or can be designed as a component of the clamping jaw guide apparatus.

In order to keep the design of the clamping jaw guide apparatus as simple as possible, a preferred embodiment provides that the delivery table has an opening extending in the first horizontal direction, a pusher being movable in said opening in the first horizontal direction, wherein the pusher is coupled to a drive. The mechanism for moving the pusher is therefore disposed primarily below the delivery table so that the number of components of the clamping jaw guide apparatus is reduced.

In order to avoid slippage of clamping jaws against piece goods as they are retrieved, in a preferred embodiment at least one section of the clamping surfaces of the clamping jaws comprises a non-slip material, i.e. either the jaw is made of such a material or it is coated with a corresponding material at least in sections.

Below, an embodiment of the operating device according to the invention is described, with reference to the drawing, wherein

Figures 1a, 1b show oblique views of a preferred embodiment of the operating device according to the invention,

Figures 2a, 2b show oblique views of the clamping jaw guide apparatus of the preferred embodiment,

Figure 3 shows a detailed oblique view of the clamping jaw guide apparatus of the preferred embodiment, wherein some components are left out,

Figures 4a, 4b show a top view and a bottom view of the clamping jaw guide apparatus according to Figure 3,

Figure 5 shows a detailed oblique view of the clamping jaw guide apparatus with the parallel clamping jaws brought together, wherein some components are left out,

Figures 6a, 6b show a top view and a bottom view of the clamping jaw guide apparatus according to Figure 5.

Figures 1a, 1b show two oblique views of a preferred embodiment of the operating device according to the invention, wherein Figure 1a reflects an oblique view from above and Figure 1b reflects an oblique view from below. The operating device according to the invention comprises a delivery table 10, above which two clamping jaws 20a, 20b, with opposing clamping surfaces 21a, 21b, are disposed. At the free ends of said clamping jaws 20a, 20b, there is a section 22a, 22b that is coated with a non-slip material.

At the free ends of the clamping jaws, the delivery table 10 comprises a storage and retrieval side 15 past which medicinal packages are pushed from the delivery table onto storage areas or pulled from the storage areas onto the delivery table. The storage and retrieval direction corresponds to the first horizontal direction x indicated in Figure 1a.

The delivery table has a central slotted opening 11 that extends in the storage and retrieval direction, i.e in the first horizontal direction x. A pusher element 12 with a broadened pushing head 13 is disposed in the opening 11. The pusher element 12 can be moved in the slotted opening 11 in the storage

and retrieval direction, i.e. in the first horizontal direction x.

A clamping jaw guide apparatus 30 is disposed opposite to the storage and retrieval side 15, with clamping jaws 20a, 20b being connected to said apparatus, the apparatus comprising the mechanism for tilting the clamping jaws. In the upper section, the clamping jaw guide apparatus 30 comprises a drive unit 50 with two drives 51, 52 as well as associated transmissions 53, 54. In the embodiment shown, these two drives cause the clamping jaws to tilt in a manner described in detail in the subsequent figures. The clamping jaw guide apparatus further comprises an optical detector 2 for monitoring various aspects of the storage and retrieval process.

The clamping jaw guide apparatus 30 and all the electronic components thereof are connected to a control unit 4 that is disposed below a fastening arm 3 in the embodiment shown. The fastening arm 3 itself is fastened to the delivery table or to a substructure thereof by way of a swivel joint.

To store and retrieve medicinal packages, the clamping jaw guide apparatus 30 must be moved in the first horizontal direction x, i.e. the storage and retrieval direction. To this end, in the embodiment shown a drive 60 is disposed below the delivery table, the drive moving the clamping jaw guide apparatus 30 as described in the subsequent figures in detail. Further disposed below the delivery table is another drive 6 for moving the pusher element 12 in the first horizontal direction x in the slotted opening 11.

Figures 2a and 2b show oblique views of the clamping jaw guide apparatus 30 together with the clamping jaws 20a, 20b. The clamping jaw guide apparatus 30 comprises a frame structure 31, 32, 33a, 33b, wherein the front component 31 reaches around the clamping jaws (and the delivery table, which is not shown). Fastened at the lower ends of component 31 are moving parts 62a, 62b (the "runners") of a linear drive, said runners being able to move the clamping jaw guide apparatus 30 in the first horizontal direction. The components are called "moving" components since they move in the first horizontal direction together with the clamping jaw guide apparatus along

corresponding stationary parts (which are rotated so as to move the moving parts). The stationary parts 61a, 61b (see Figure 1b) themselves can move in order to move the moving parts, for example by rotation of the stationary parts, whereby this
5 rotational motion can move the moving parts along the longitudinal axis of the stationary parts. The stationary parts are therefore only themselves stationary relative to the positions thereof within the operating device.

For example, in an alternative embodiment, it is conceivable
10 that the stationary parts are designed as belts designed between the longitudinal ends of the operating device and that cooperate with corresponding pulleys for moving the moving parts.

As can be seen in Figures 2b and 3, two guides 35, 36, a first guide 35 and a second guide 36, extend between lateral
15 frame structure components 33a, 33b in a second horizontal direction y parallel to one another, the guides being separate from one another in the first horizontal direction x, wherein the first guide faces the free ends of the clamping jaws.

Two clamping jaw carriages 40a, 40b; 41a, 41b are disposed
20 at each of the guides 35, 36; two first clamping jaw carriages 40a, 40b at the first guide 35 and two second clamping jaw carriages 41a, 41b at the second guide 36. In the embodiment of the operating device shown, a section of the clamping jaw carriages reaches around a projecting end of the guides 35, 36
25 such that part of the clamping jaw carriages sit on said projecting end.

In alternative embodiments, the guides and carriages can be designed in slightly different ways. For example, it is also conceivable that the guides are designed as simple tubes through
30 which surrounding clamping jaw carriages can be moved. The exact design of the guides and the clamping jaw carriages is insignificant for the present invention; it is only important to ensure that the clamping jaws can move parallel to one another and in the second horizontal direction y, which runs
35 perpendicular and orthogonal to the first horizontal direction x.

As can be seen in Figure 3 in particular, the clamping jaw carriages 40a, 40b; 41a, 41b are connected to drive elements

45a, 45b; 46a, 46b, which are designed as toothed racks in the embodiment shown. The drive elements 45a, 45b associated with the first guide 35 and the corresponding first clamping jaw carriages 40a, 40b and the corresponding drive elements 46a, 46b associated with the second guide 36 are aligned relative to the tooth elements of the racks in such a way that the tooth elements oppose one another and form an overlapping area at the free ends thereof. Disposed in the center of the overlapping area of the respective drive elements or racks is a respective drive gear 55, 56 that is coupled to a drive 51, 52 by way of a transmission 53, 54 (not shown in Figure 3). The distance between the clamping jaw carriages 40a, 40b; 41a, 41b of a guide and the corresponding drive gear thereof is identical, in other words a drive gear is disposed precisely in the center between two clamping jaw carriages so that a movement of the drive gear causes synchronous movements of the clamping jaw carriages. When the drive gear is rotated, the clamping jaw carriages are moved synchronously toward or away from one another, wherein the same applies to the clamping jaw carriages associated with the two guides 35, 36.

The clamping jaw carriages of the first guide can therefore be moved simultaneously or separately with respect to the clamping jaw carriages of the second guide, providing a large degree of flexibility with regard to movement of the clamping jaw carriages. The clamping jaw carriages of the first and second guide can be moved synchronously or only the clamping jaw carriages associated with either the first or the second guide can be moved. In this way, it is possible to move the clamping jaws that are fastened to the clamping jaw carriages, in parallel or already tilted, simultaneously without any change in angle (by simultaneously moving the clamping jaw carriages of both guides), or if it is only the clamping jaw carriages of one guide that are to be moved, it is possible to tilt the clamping jaws.

In the embodiment shown, one drive element is associated with each clamping jaw carriage. In an alternative embodiment, it is conceivable that only two drive elements are provided, wherein the two elements are associated with one guide and for

example are designed as belts for driving the clamping jaw
carriages. In a corresponding embodiment, pulleys would also
have to be provided for the belts. These could be coupled to the
guides or to the frame structure. Further, a coupling between
5 the drive unit and the drive elements / belts would have to be
provided, which can be implemented using means known to one
trained in the art.

As explained already, clamping jaws 20a, 20b are coupled to
the clamping jaw guide apparatus 30. This coupling can be seen
10 in Figure 2b. In the embodiment shown, clamping jaws 20a, 20b
are connected to clamping jaw carriages 40a, 40b by way of a
respective swivel joint 23a, 43a; 23b, 43b of the first guide 35
and to clamping jaw carriages 41a, 41b of the second guide 36 by
way of a slotted hole guide 24a, 25a, 44a; 24b, 25b, 44b. In
15 alternative embodiments, the swivel joint can be disposed at the
clamping jaw carriages associated with the second guide, in this
case what is required for the combination shown is that the
slotted hole guides are disposed at the clamping jaw carriages
associated with the first guide 35.

20 However, it is not absolutely necessary to use the swivel
joint/slotted hole guide combination. The clamping jaws must of
course be held using a swivel or pivot joint at the
corresponding clamping jaw carriages of at least one guide, but
use of a slotted hole guide is not absolutely required. Thus,
25 for example, it is conceivable that in an alternative embodiment
the clamping jaws are moved together with the clamping jaw
carriages against a restoring force, and when the clamping jaw
carriages are moved back the restoring force moves the clamping
jaws back.

30 Figures 4a, 4b show a top view and bottom view of the
clamping jaw guide apparatus with the clamping jaws tilted,
wherein parts of the frame structure and the drive unit are left
out. In Figure 4a, it is easily seen that the drive gears 55, 56
are disposed exactly in the center between corresponding
35 clamping jaw carriages 40a, 40b; 41a, 41b so that a rotating
motion of the drive gears 55, 56 effects a synchronous movement
of the associated clamping jaw carriages.

Figure 4b shows a detailed view of the swivel joints 23a, 43a; 23b, 43b and the slotted hole guides 24a, 25a, 44a; 24b, 25b, 44b. Pins or projections 43a, 43b, 44a, 44b of the swivel joints and slotted hole guides are provided by the corresponding clamping jaw carriages, whereas the corresponding receptacles are provided by the clamping jaws or by components disposed thereon.

Figure 5 shows a detail view of the clamping jaw guide apparatus 30, wherein parts of the drive unit 50 and of the frame structure are left out to provide a better view of the remaining components. In Figure 5, clamping jaws 20a, 20b have been brought together and are aligned parallel with one another. In a comparison of Figures 3, 5, it can be seen how the position of the clamping jaws is influenced by a shift of the clamping jaw carriages at the guides.

Figures 6a, 6b show a top view and a bottom view according to 5, i.e. of a clamping jaw guide apparatus with parallel clamping jaws brought together. In Figure 6b, it can be seen that the projections or pins 44a, 44b of the clamping jaw carriages of guide 36 are disposed in slotted holes 25a, 25b entirely "at the bottom" since the clamping jaws are situated parallel and thereby the section of the clamping jaws located between the first and second guides 35, 36 is the smallest. When the clamping jaws are tilted, whether inward or outward (relative to the ends of the clamping jaws), the section of the clamping jaws (i.e. the length thereof) located between the guides increases such that the projections or pins 44a, 44b would travel "upward" within slotted holes 25a, 25b. In the embodiment shown, it is also not required for the "slotted hole" as such to be closed, an open slotted hole, i.e. a type of fork, can also be used for guiding the pins or projections.

CLAIMS

1. An operating device (1) for a commissioning device with horizontal storage surfaces for storing piece goods, comprising:
5 a delivery table (10) which extends in a first horizontal direction (x) and has a storage and a retrieval end (15),
two elongated clamping jaws (20a, 20b) disposed above the delivery table (10) and comprising clamping surfaces (21a, 21b) facing one another,
10 a clamping jaw guide apparatus (30) with
a frame structure (31, 32, 33a, 33b),
at least one first and one second guide (35, 36) which are parallel and apart from one another in the first horizontal direction (x) and extend in a second horizontal
15 direction (y) perpendicular to the first horizontal direction, and
at least four clamping jaw carriages (40a, 40b, 41a, 41b) coupled to the guides (35, 36) and driven in the second horizontal direction (y), wherein two first clamping jaw
20 carriages (40a, 40b) are associated with the first guide (35) and two second clamping jaw carriages (41a, 41b) are associated with the second guide, respectively, and wherein at least two clamping jaw carriages (40a, 41a; 40b, 41b) separated from one another in the first horizontal direction
25 (x) are coupled to a single clamping jaw (20a, 20b), respectively, and
a drive unit (60, 61a, 61b, 62a, 62b) coupled to the clamping jaw guide apparatus, the drive unit driving the clamping jaw guide apparatus (30) in the first horizontal
30 direction (x).

2. The operating device (1) for a commissioning device according to claim 1, characterized in that the clamping jaw guide apparatus (30) comprises at least two drive elements
35 coupled to a drive unit (50), wherein a first drive element is

connected to the first clamping jaw carriages (40a, 40b) and a second drive element is connected to the second clamping jaw carriages (41a, 41b), wherein the first and the second drive elements are disposed at a distance from one another in the first horizontal direction (x).

3. The operating device (1) for a commissioning device according to claim 1, characterized in that the clamping jaw guide apparatus (30) comprises at least four drive elements (45a, 45b, 46a, 46b) coupled to a drive unit (50), wherein two first drive elements (45a, 45b) are connected to the first clamping jaw carriages (40a, 40b) and two second drive elements (46a, 46b) are connected to the second clamping jaw carriages (41a, 41b), wherein the first and the second drive elements (45a, 45b; 46a, 46b) are disposed at a distance from one another in the first horizontal direction (x).

4. The operating device (1) for a commissioning device according to claim 3, characterized in that the drive elements (45a, 45b, 46a, 46b) are designed as toothed racks.

5. The operating device (1) for a commissioning device according to claim 4, characterized in that the drive unit (50) comprises at least two drives (51, 52) which have one drive gear (55, 56) each and in that the first and second drive elements (45a, 45b; 46a, 46b) are designed as toothed racks disposed opposite to each other, wherein a respective drive gear (55, 56) is disposed in the center between the first and second drive elements (45a, 45b; 46a, 46b) so that the respective clamping jaw carriages (40a, 40b; 41a, 41b) associated with a guide (35, 36) are driven synchronously.

6. The operating device (1) for a commissioning device according to one of claims 1 - 5, characterized in that a component (31) of the frame structure (31, 32, 33a, 33b) reaches around the delivery table (10) and is coupled to the drive unit (60, 61a, 61b, 62a, 62b) for moving the clamping jaw guide

apparatus (30), the drive unit being disposed below the delivery table (10).

7. The operating device (1) for a commissioning device
5 according to one of claims 1 - 6, characterized in that the drive unit (60, 61a, 61b, 62a, 62b) for moving the clamping jaw guide apparatus (30) is designed as a linear drive with moving parts (61a, 61b) and stationary parts (62a, 62b).

10 8. The operating device (1) for a commissioning device according to one of claims 1 - 7, characterized in that the delivery table (10) comprises an opening (11) that extends in the first horizontal direction (x), a pusher (12) being moveably disposed in said opening in the first horizontal direction (x),
15 wherein the pusher (12) is coupled to a drive (6).

9. The operating device (1) for a commissioning device according to one of claims 1 - 8, characterized in that at least one section (22a, 22b) of the clamping surfaces (21a, 21b) of
20 the clamping jaws (20a, 20b) comprises a non-slip material.