

Apparatus and Method for Identifying, Measuring and Positioning Piece Goods

The present invention relates to an apparatus and a method
5 for identifying, measuring and positioning piece goods, in
particular pharmaceutical packages.

From the prior art, the aforementioned apparatuses and
corresponding methods are known. Piece goods, such as
pharmaceutical packages, which are thereby provided disordered
10 and in large numbers, are isolated, identified and made
available for automatic storage. A disadvantage of the known
apparatuses and methods is that they have a relatively low
throughput, which is not sufficient for large piece good volumes
(and accordingly large piece good storage). Another disadvantage
15 of known apparatuses and methods is that separated piece goods
can thereby only be fed sequentially into storage, which is one
reason for the low throughput.

It is an object of the present invention to provide an
apparatus and a method for identifying, measuring and
20 positioning piece goods, in which the processing speed and
flexibility are increased.

This object is achieved first by an apparatus according to
claim 1. The apparatus according to the invention for
identifying, measuring and positioning piece goods, in
25 particular pharmaceuticals, comprises an optically transparent
turntable with a support surface for piece goods, which support
surface extends in an X and Y direction of the apparatus,
wherein this turntable cooperates with a rotary drive coupled to
a control device and is rotatable about an axis of rotation
30 extending in a Z direction, wherein the Z direction extends
orthogonally to the X and Y directions and wherein the X
direction corresponds to the longitudinal axis and the Y
direction corresponds to the transverse axis of the device. The
apparatus further comprises a first conveying device for
35 arranging a piece good on the support surface of the turntable
and a first optical reading device for detecting the X, Y

dimensions of the piece good resting on the support surface,
wherein the reading device is arranged in the Z direction below
the turntable and is coupled to the control device, and an
identifier on one side surface of the resting piece good faces
5 the support surface.

By way of example, the first optical reading device may be a
camera which produces an image of the side surface facing the
support surface, which is optionally forwarded to the control
device which examines the image obtained with regard to the X, Y
10 dimensions and the presence of an identifier. Alternatively, the
reading device itself can perform the aforementioned analysis of
the image and forward the results to the control device. With
the help of the identifier, it can be clearly determined which
pharmaceutical was arranged in which dispensing form on the
15 turntable. The identifier may be, for example, a barcode.
Alternatively, a laser can be used as an optical reading device
which scans a side surface.

The apparatus further comprises a second optical reading
device, which is likewise coupled to the control device, for
20 detecting the Z dimension (i.e. the height) of the piece good
resting on the support surface and an identifier on a side
surface orthogonal to the support surface. This second optical
reading device can also be a camera, for example, which operates
as already described above. Downstream of the turntable is
25 provided a storage area for a plurality of piece goods, wherein
the arrangement of the turntable and the storage area to each
other defines the longitudinal axis of the apparatus.

The storage area may be provided by a variety of facilities.
For example, by a conveying device belt of a storage facility.
30 The storage area is then not a fixed portion of the conveying
device belt, but is always provided by the portion or the
support surface of the conveying device belt, which is located
in a predetermined portion, which can be accessed by the second
conveying device. Alternatively, a slidable storage tray may
35 provide the storage area or, in the simplest case, an immovable
storage table.

The apparatus according to the invention finally comprises a
second conveying device coupled to the control device having a
gripping means for piece goods, wherein the gripping means is

movable in the storage area, at least in the X and Y directions, such that piece goods can be arranged side by side in the storage area in the X and/or Y directions.

Of known apparatuses, the apparatus according to the invention differs in particular by the use of two conveying devices, wherein the first is adapted to receive a piece good from an arbitrarily designed supply device and to feed it to the turntable, on which the identification of the piece good takes place, whereas the second conveying device is provided to pick up the piece goods after identification and measurement and to arrange it in the storage area. According to the invention, the second conveying device is designed in such a way that it can be moved in both the X and Y directions over the storage area such that the piece good gripped by the second conveying device can be arranged at any position of the storage area.

According to the invention, the storage area is dimensioned so that a plurality of piece goods of "usual" size can be arranged side by side in the X and/or Y directions of the apparatus. This makes it possible to pick up a plurality of piece goods in the storage area or from the storage area during a gripping process by means of a gripper of a picking apparatus which does not belong to the apparatus according to the invention itself. This is not possible in the case of apparatuses according to the prior art, since the identified piece goods are always arranged successively at the same position due to the limitations of the known apparatuses, i.e., identified piece goods can only be gripped and stored sequentially, one after the other.

The throughput of the device according to the invention is on the one hand increased by the fact that two conveying devices are used - the one for arranging piece goods on the turntable, the other for gripping piece goods from the turntable and arranging them in the storage area. Due to the inventive design of the second conveying device, it is possible, in terms of storage, to arrange piece goods so that a plurality of piece goods can be gripped simultaneously, which in turn increases the throughput of the apparatus and the storage speed of the picking apparatus which is usually arranged downstream.

In the apparatus according to the invention, a first optical reading device is arranged below the turntable and a second optical reading device is arranged laterally of the turntable. If, in the case of the piece goods resting on the turntable, the identifier is arranged on the turntable facing the "lower" side surface of the piece good or is arranged on one of the side surfaces designed orthogonally to the lower side surface of the piece good, an identification of the piece good is possible with the two aforementioned reading devices. Only in the event that only one identifier is arranged on the piece good, which identifier is arranged on the side surface facing away from the surface of the turntable due to the placement of the piece good, no identification is possible with the two reading devices, so that a repositioning of the piece good on the turntable is necessary. To avoid this, it is provided in a preferred embodiment of the invention that the apparatus has a third optical reading device arranged in the Z direction above the turntable and coupled to the control device for detecting the dimensions of the piece good and/or of an identifier resting on a side surface facing away from the support surface.

In the apparatus according to the invention, the piece goods are arranged on the turntable with the first conveying device. How exactly the gripping of a piece good takes place is not substantial for the present invention. Regularly, however, the gripping of a piece good from a plurality of piece goods resting on a supply device takes place, wherein the conveying device does not always pick up a piece good at a preferred side surface (for example, the largest side surface of the piece good), but at the side surface, which is most suitable for picking up the piece good. As a result, it is uncertain in which arrangement the piece good is gripped by the first conveying device, i.e. it may happen that a piece good is gripped, for example, at an end face or at a non-largest side surface of the piece good. The piece goods are therefore not always arranged with the same side surface on the turntable, for example not always with the largest side surface of the piece good but depending on how they are picked up by the conveying device or its gripping means. Regularly, however, it is preferred that piece goods be stored resting on the largest side surface, for which it is necessary

that the piece goods rest on exactly this largest side surface on the turntable.

In order to be able to achieve this, it is necessary to know the orientation of the piece good gripped or storageped with the
5 first conveying device. For this purpose, it is provided in a preferred embodiment of the device according to the invention that this comprises an optical coarse detection device, such as a 2D or 3D camera, for determining the spatial orientation of a piece good. The spatial orientation can be determined for
10 example after gripping a piece good. If, for example, it is ascertained during the determination of the spatial orientation that a piece good is deposited on a non-largest side surface, i.e. a non-largest side surface facing the support surface of the turntable, the piece good can be repositioned based on the
15 knowledge of the spatial orientation of, for example, the first or second conveying device (for example, by simply overturning directly after depositing) so that the piece good rests on its largest side surface.

Occasionally, it may happen that the identifier arranged on
20 a side surface on a piece good, for example, is impaired by transport damage such that an identification of a piece good is not possible. In a preferred embodiment, it is therefore provided that a discarding device for discharging piece goods is arranged between the turntable and the storage surface. This may
25 be, for example, a flap which can be pivoted in the Z direction and which is opened for discharging a piece good if the identification is not possible.

The exact configuration of the first and/or second conveying device, in particular its gripping means, is not substantial for
30 the present invention. In a preferred embodiment of the present invention, however, it is provided that the first and/or the second conveying device is or are designed as suction grippers which are movable in the X, Y and/or Z direction. Due to the design as a suction gripper, in particular the picking up of
35 piece goods from a plurality of piece goods is facilitated in the first conveying device since, in contrast to, for example, clamping grippers, a close juxtaposition of piece goods does not stand in the way of picking up a piece good. In particular, since the second conveying device or the gripping means of this

conveying device is also movable in the Z direction, it is also possible to arrange piece goods on the support surface one above the other. This can be useful, for example, in the case of identical pharmaceutical packages, if experience has shown that
5 they are very frequently and/or repeatedly to be outsourced.

The dimensions and weights of the piece goods to be handled with the apparatus can vary greatly, i.e. heavy small and large light piece goods can be present. In order to optimally adapt a suction gripper to the differently dimensioned and differently
10 heavy piece goods, it is provided in a preferred embodiment that a suction gripper has at least two differently dimensioned suction heads.

In an alternative preferred embodiment, it is provided that the second conveying device is designed as a clamping gripper
15 which is movable at least in the X and Y directions. The use of a clamping gripper is particularly useful when it comes to relatively large and heavy piece goods, whose gripping with a suction gripper is problematic.

How exactly the piece goods of the first conveying device
20 are provided is not substantial to the present invention. In a preferred embodiment, however, provision is made for the apparatus to comprise a supply device and a position detection device arranged in the Z direction above the supply device. The position detection device is usually a 3D camera, with which the
25 positioning of different piece goods in a plurality of piece goods can be detected. By means of the control device coupled to the position detection device, a next optimal gripping surface of a piece good can be determined, via which the piece good can be removed from the plurality of piece goods. In the embodiment
30 according to the invention, it is possible, without the assistance of a user, to offer a plurality of piece goods by means of the supply device, which are then fully automatically isolated and identified, and arranged in the storage area for later storage.

35 The object is further achieved by a method according to claim 9. In the method according to the invention for identifying, measuring and positioning piece goods a) a single piece good is arranged on a first side surface on a support surface of an optically transparent turntable, which support

surface extends in the X and Y directions, by means of a first conveying device, wherein the turntable cooperates with a rotary drive coupled to a control device and is rotatable about an axis of rotation extending in the Z direction, wherein the Z
5 direction extends orthogonally to the X and Y directions and wherein the X direction corresponds to the longitudinal axis and the Y direction corresponds to the transverse axis of the apparatus. In step b) the first optical reading device arranged in the Z direction below the turntable scans the first side
10 surface and it determines the X, Y dimensions of the piece good resting on the storage surface and determines whether an identifier was detected during the scanning of the first side surface. In step c) a second side surface, which is designed orthogonally to the first side surface, is scanned with a second
15 optical reading device and the Z-dimension (i.e. the height) of the piece good resting on the support surface is detected. If no identifier was detected on the first side surface, it is determined whether an identifier was detected during the scanning of the second side surface, wherein the steps b) and c)
20 can be performed simultaneously or staggered.

First of all, therefore, the "lower" side surface and a side surface of the piece good that is designed orthogonally to it, which may in particular be a pharmaceutical package, are measured and scanned with regard to an identifier. If no
25 identifier can be determined at the lower first side surface and at the second side surface arranged orthogonally to the lower side surface, the turntable is rotated in a step d) such that a next side surface perpendicular to the first side surface faces the second optical reading device, wherein the second reading
30 device scans the next side surface and determines whether an identifier was detected in the scanning of the next side surface. This step d) is repeated according to the invention until three next side surfaces are scanned or an identifier is detected. In the event that no identifier was detected, the
35 piece good is removed from the turntable and fed to a further use in a method step e). As soon as an identifier and possibly all dimensions of the piece good resting thereon are determined, a storage location in a "storage area", which is arranged downstream of the turntable, is determined by a control device

on the basis of the dimensions and/or optionally of the identifier. Such a determination is necessary because it should be possible by means of the method according to the invention to arrange piece goods in the storage area, such that several piece
5 goods can be removed from this at the same time. How exactly the piece goods are arranged in the storage area, depends on the one hand on the dimensions of the piece good(s) already resting on the support surface and the removal direction of a gripper, with which a plurality of piece goods can be removed.

10 After determining the storage location of the piece good in the storage area said product is gripped by a gripping means of a second conveying device and moved to the storage location, for which purpose the gripping means is moved in the X and possibly Y and Z directions.

15 It is essential in the method according to the invention that the piece goods after identification by means of the second conveying device are not simply moved to a consistently same storage location, from which they are moved or gripped, but that by means of the control means a storage location is determined
20 in the storage area, namely depending on the dimensions of the piece goods to be stored and the possibly already stored piece goods and the removal direction. It can thereby be achieved that a plurality of piece goods is arranged side by side in such a way that they can be gripped simultaneously with
25 a gripper. How exactly the arrangement of the piece goods has to be made depends on how the gripper accesses the piece goods, for example, whether said gripper is moved along the X or Y direction into the space above the storage surface.

In order to ensure that even in the event that the piece
30 good has only one identifier, a repositioning of the piece good to recognize the identifier is not necessary, it is provided in a preferred embodiment that in method step b) a third optical reading device arranged in the Z-direction above the turntable scans a side surface of the piece good, which rests on the
35 turntable, which side surface faces this reading device side, wherein the X, Y dimensions of the piece good resting on the support surface are possibly determined wherein it is determined whether an identifier was detected during the scanning of the side surface.

Before the removal of the piece good, in order to recognize in which orientation the piece good is gripped, it is provided in a preferred embodiment of the inventive method that the spatial orientation of the piece good held by the first
5 conveying device is determined in step a) before arranging the piece good on the support surface of the turntable by means of a coarse detection device. Once the spatial orientation is determined, the controller may already begin to determine the optimal storage location in the storage area.

10 If a coarse detection device is used, it is provided in a preferred embodiment of the method that the coarse detection device is designed as an optical reading device and the piece good is scanned during the determination of the spatial orientation in order to detect an identifier. Depending on the
15 orientation of the identifier, it may happen that an identifier can already be scanned with the coarse detection device. This saves time for the subsequent method steps, so the method can be accelerated.

Often, it is desired that piece goods be stored resting on
20 the largest side surface. However, since it is not ensured when gripping the piece goods by means of the first conveying device, that the piece goods are gripped by the first conveying device so that they can be placed on a largest side surface on the turntable, it is provided in a preferred embodiment that if it
25 is detected during the determination of the spatial orientation that the largest side surface of piece good held by the conveying device is not facing a the support surface, that the piece good is moved after being arranged on the support surface by means of a conveying device so that the piece good rests on a
30 largest side surface on the support surface.

In the following, preferred embodiments of the apparatus according to the invention and of the method according to the invention will be described with reference to the attached drawing, in which:

35 Figure 1a is an oblique view and Figure 1b shows a side view of a first embodiment of the apparatus according to the invention with schematically indicated detection areas of reading and detecting devices;

Figure 2 shows an oblique view of the embodiment shown in Figures 1a and 1b without the detection areas;

Figure 3 shows a further oblique view of the first embodiment without detection areas and reading and detecting devices;

Figure 4 shows a plan view of the first embodiment;

Figure 5 shows a second embodiment of the apparatus according to the invention;

Figures 6a-6c show various stages of a first embodiment of the method according to the invention;

Figures 7, 8 and 9 show further embodiments of the method according to the invention, in which the piece goods are each arranged differently in the storage area;

Figure 10 shows a third embodiment of the apparatus according to the invention;

Figure 11 shows a fourth embodiment of the apparatus according to the invention;

Figure 12 shows a detailed view of the first conveying device of the fourth embodiment;

Figures 13a-13c show a further embodiment of the method according to the invention; and

Figure 14 shows a flow chart of an embodiment of the method according to the invention.

Figures 1a and 1b show an oblique view and a side view of a first embodiment of an apparatus 1 according to the invention. The apparatus 1 comprises a central optically transparent turntable 10 with a support surface 11. This support surface extends in the X and Y directions, wherein the X direction corresponds to the longitudinal axis of the apparatus. The optically transparent turntable 10 cooperates with a rotary drive 12, via which the turntable is rotatable about an axis of rotation extending in the Z-direction, wherein the Z-direction extends orthogonally to a plane spanned by the X and Y directions. In the embodiment shown, the rotary drive is arranged at a discarding device 13, which has a round recess at an end face facing the turntable 10, which is adapted to the diameter of the turntable such that only a narrow gap is designed between the discarding device 13 and the turntable 10, over which piece goods can be easily pushed if necessary. Below

the turntable 10, a first optical reading device 61 is arranged, wherein in Figures 1a and 1b, the detection range 61a of this reading device is indicated schematically. A piece good resting on the turntable is scanned by means of the first optical
5 reading device 61 in order to determine its X and Y dimensions. Furthermore, an attempt is made to read an identifier which is possibly attached on the side surface of the piece goods facing the turntable in order to use this identifier to determine the exact kind of pharmaceutical and packing. The first reading
10 device 61 is coupled to a control device 20 via lines which are not shown. The determination of the X and Y dimensions and the attempt to detect the identifier are carried out either by the reading device itself or by the control device, with the aid of known image processing software. Whether the determination of
15 the dimensions and of the identifier is performed by the reading device itself or the control device depends on the exact configuration of the reading device. If this is designed by a simple 3D camera, the actual determination of the dimensions and of the identifier is carried out by image processing software
20 running in the control device.

On the side of the turntable 10, and in the embodiment shown in a range of a supply device 70, a second optical reading device 62 is arranged with a detection area 62a, which reading device is provided for detecting the Z dimension, i.e. the
25 height of the piece good and for scanning an identifier on a side surface of the piece good which side surface extends orthogonally to the storage surface of the turntable.

In the embodiment shown, the aforementioned supply device 70 comprises a conveying device belt 72 and side walls 71. In the
30 illustrated embodiment, the supply device supplies piece goods in the X direction, i.e. from upstream of the turntable with respect to the X direction. The supply device 70 comprises a buffer zone 73 downstream of the conveying device belt 72, in which the movement of delivered piece goods is stopped and which
35 can take up piece goods that may slip when gripping a piece good from a plurality of piece goods. In the buffer zone the second optical reading device 62 is also arranged.

In the embodiment shown, a third optical reading device 63 having a detection area 63a is arranged in the Z direction above

the turntable, wherein the third optical reading device is provided for detecting an identifier on a side surface of the piece good facing away from the turntable. If this has not already been done with the first optical reading device, the X and Y dimension of the overlaid piece good can optionally also be determined via the third optical reading device. Also, the third optical reading device 63 is connected via lines (again not shown) with the control device 20 and may be designed according to the first reading device and operated accordingly, i.e. the determination of the dimensions or the identifier can be performed by the reading device itself or by the control device.

Downstream of the turntable a storage device 50 is provided, which in the embodiment shown comprises a conveying device belt 52, wherein a portion of this conveying device belt provides a storage area 51, on which piece goods can be storageped after identification. Thus, due to the use of a conveying device belt, the storage area is not always provided by the same section but it is provided by different sections of the conveying device belt depending on the movement of the conveying device belt. The orientation of the storage device is not substantial to the present invention. In the embodiment shown, this is designed in the Y direction, wherein stored piece goods can be moved by means of the conveying device belt before they are taken by a gripper from the conveying device belt. The storage device may also comprise a movable conveying device plate, by means of which storageped piece goods are moved. Alternatively, it is also possible that the storage device comprises a non-movable conveying device table, which provides the storage area 51.

The conveying device further comprises a guide 80 extending in the X direction, on which a first conveying device 30 and a second conveying device 40 are guided, both of which are coupled to the control device 20 with lines (not shown), and which are described in more detail with reference to the figures below.

Above the supply device 70, a position detection device 65 is arranged with a detection area 65a, wherein the position detection device is connected to the control device 20 via lines (not shown). By means of the position detection device 65, piece goods resting on the conveying device belt 72 are analyzed and

it is determined which piece good is picked up next from the plurality of piece goods with the first conveying device 30. The position detection device may be designed, for example, as a 3D camera, which forwards the captured images to the control
5 device, where it is determined by means of conventional image processing software, which piece good will be taken next.

The piece goods provided by the supply device 70 are usually arranged chaotically and disorderly on the conveying device belt 72. The piece goods are thus disordered on the supply device,
10 i.e. the orientation of the different piece goods differs, so that a piece good can rest, for example, on a largest side surface on the supply device, whilst another can rest on a narrow side surface. How a piece good is gripped by means of the first conveying device is often not detectable with the position
15 detection device, i.e. the orientation of the gripped piece good is not known because the control device cannot determine the other dimensions only from the dimensions of the side surface of a piece good facing the control device.

In order to determine the orientation of a piece good, which
20 was gripped by the supply device with the first conveying device, the apparatus comprises a coarse detection device 64 with a detection area 64a in the embodiment shown, which detection device is also arranged above the supply device and laterally to the first conveying device. With the coarse
25 detection device, the Z and Y dimension of the received piece goods can be determined. Based on the X-dimension already known by the position detection device, the orientation of the gripped piece good can be determined, so that they may possibly still be varied in preparation of the arrangement on the turntable or
30 after being storageped. For example, if it is determined that the largest side surfaces of the gripped piece good extend in the Z direction, the piece good can be overturned after being arranged on the turntable with the first or the second conveying device, so that the piece good rests with a largest side surface
35 on the turntable.

Figures 2 and 3 show further oblique views of the first embodiment, wherein in Figure 2, the detection areas of the optical reading devices are omitted, so that the remaining components of the device are more visible. In Figure 3, the

optical reader devices, the coarse detection device and the position detection device are also omitted so that the first and second conveying devices 30, 40 can be accurately seen, which will be described in more detail below.

5 The first conveying device 30 comprises an X carriage 31 which is movable in the X direction on the guide 80. The X carriage comprises a Z guide on which a Y guide 32 is movable in the Z direction. On the Y guide in turn a holder 33 is arranged movably in the Y direction, the holder having a rotary bearing
10 34 at its lower end face facing the turntable 10 on which a gripping means 35 is arranged, which is designed in the embodiment shown as a suction pad with double suction head, which is described in more detail with reference to Figure 12.

 The second conveying device 40 also comprises an X carriage
15 41 which is movable in the X direction on the guide 80. Furthermore, the second conveying device comprises a Y guide 42, which is designed integrally with the X carriage in the embodiment shown, that therefore is not movable on the X carriage in the Z direction, as it is the case with the first
20 conveying device. Two brackets 43 are arranged on the Y guide 42 of the second conveying device, which are movable in the Y direction, i.e. away from each other and toward each other. At each holder 43, a gripping means 45 is arranged, wherein the gripping means 45 are designed as clamping jaws in the second
25 conveying device. In the embodiment shown in Figures 2 and 3, a piece good 2 is held between the clamping jaws 45 and can be moved with the second conveying device 40 via the discarding device 13 to the storage area 51 arranged downstream of the turntable. Upstream of the turntable, the supply device 70 is
30 arranged to provide a plurality of piece goods (not shown).

 Figure 4 shows a plan view of the first embodiment of the apparatus according to the invention, wherein the reading devices and the detection devices are omitted. In the top view, it can be seen in particular that the supply device 70 is
35 arranged upstream of the optically transparent rotary plate 10 and the storage device 50 is arranged downstream of this turntable. By way of the supply device 70, piece goods (not shown), in particular pharmaceutical packages, are provided, which are then transferred from the first conveying device 30 to

the turntable 10, from where they are moved into the storage area 51 of the storage device 50 by means of the second conveying device 40.

Figure 5 shows an oblique view of a second embodiment of the apparatus according to the invention. In this embodiment, the second detection device 62 is arranged slightly differently, namely below the supply device 70, which in this embodiment also comprises no buffer zone. The coarse detection device 64 is arranged differently from the first embodiment, namely on the guide 80 of the apparatus, namely in the vicinity of the turntable 10.

Figures 6a-6c show different positions of the second conveying device in a first embodiment of the method according to the invention and are intended to illustrate how a piece good can be moved into the storage area 51. In Figure 6a, four piece goods are arranged in the storage area 51, wherein in the embodiment shown, two identically dimensioned piece goods are arranged one above the other and the two stacks of piece goods are arranged one behind the other in the X direction. In the embodiment shown, the storage device 50 comprises a conveying device belt 52, by means of which piece goods arranged in the storage area 51 are movable in the Y direction. In Figure 6b, the two stacks of piece goods are already moved to "left", so that the storage area 51 is free for receiving further piece goods. With the second conveying device, another piece good 2, held by the clamping jaws 45, is already moved slightly towards the storage area 51 in the X direction. Due to the mobility of the second conveying device in the X direction, it is possible to arrange with this a plurality of piece goods, inter alia, in the X direction one behind the other in the storage area 51. Figure 6c shows the final position of the piece good 2 which is still held in the depositing area 51 by the clamping jaws 45. The clamping jaws are also movable in the Z direction, so that a stacking of piece goods is possible, which is not illustrated in the figures 6a-6c.

Figures 7-9 show a further embodiment of the apparatus according to the invention as well as different process guides with regard to the arrangement of piece goods in the storage area 51. In all of Figures 7-9, the storage device 50 is

designed to deviate from the storage device of the preceding embodiments, and indeed the storage device does not extend in the Y direction, but in the X direction. In the embodiment shown, the storage device again comprises a conveying device
5 belt 52, which provides the storage area 51 for arranging piece goods. In Figure 7, three piece goods are arranged side by side in the Y direction in a piece good row 2b, wherein the longitudinal axis of the piece goods is aligned with the longitudinal axis of the storage means 50. The piece goods shown
10 in Figure 8 are arranged rotated by 90°, i.e. the longitudinal axis of the piece goods of the piece good row 2c is aligned with the Y direction. Regardless of the orientation of the piece goods in the storage area 51, the two piece good rows 2b and 2c can be taken from the conveying device belt by, for example, a
15 clamping gripper known to the person skilled in the art (not shown), for which purpose the clamping gripper is moved in the Y direction over the conveying device belt. The piece good rows can be removed directly in the storage area, but it is also possible to first move the piece good row from the storage area
20 before removal by means of clamping gripper, as provided in Figures 7-9. Figure 9 shows an alternative arrangement of piece goods in a piece good row 2d, wherein in the embodiment shown in Figure 9, the piece goods are arranged differently, wherein a piece good (the "rear") is aligned with the longitudinal axis in
25 the X direction and two in the Y direction. Since the control device (not shown) knows the removal direction of the piece good from the storage device, it is possible for the control device to arrange the piece goods on the storage surface so that a removal of a piece good row 2d is possible even with differently
30 arranged or differently wide piece goods. When using a clamping gripper, for example, it is necessary in such a case that the widest piece good, which is gripped with the clamping jaws, is arranged on the "back" with respect to an orientation direction in the Y direction, so that it can be gripped by the tips of the
35 clamping jaws such that the piece goods which are resting in front thereof, are moved when being removed, for example, from the conveying device belt.

Figure 10 shows a representation of the first embodiment of the apparatus according to the invention, wherein in the

representation shown in Figure 10, the discarding device 13 is pivoted away downwardly at its face facing the turntable 10, so that piece goods can be discarded through the opening, for example, in a non-recognition of an identifier.

5 Figure 11 shows a third embodiment of the apparatus according to the invention, wherein in the embodiment shown, both the first conveying device 30 and the second conveying device 40 are designed as suction grippers.

10 Figure 12 shows a detailed view of the first conveying device 30 designed as a suction gripper. As can be seen in Figure 12, the suction gripper in the rotary bearing 34 comprises two suction tubes 36a, 36b on opposite sides, at the ends of which a suction head 35a, 35b is respectively arranged. The diameters of the suction heads 35a, 35b are dimensioned
15 differently, so that they can be adapted to different dimensions of piece goods to be gripped. If, for example, a piece good is to be gripped on a very narrow side surface, the suction head 35a is used; if a wider or larger side surface is to be gripped, the suction head 35b is used.

20 Figures 13a-13c show a portion of a method according to another embodiment. In this embodiment, after gripping a piece good with the first conveying device 30 by means of a coarse detection device (not shown in Figures 13a - 13c), the orientation of the piece good is determined. As can be seen from
25 Figure 13a, the piece good was picked up and deposited on the turntable 10 in such a way that the two largest side surfaces extend perpendicularly to the support surface 11 of the turntable. Since it is regularly preferred to store the piece goods on a largest side surface, the piece good in the
30 embodiment shown is overturned with the help of the second conveying device (see Figure 13b), so that it rests on a large side surface on the turntable prior to storage. It is not substantial to the process itself whether the scanning of the side surfaces, in order to recognize the identifier and the
35 dimensions, is made before or after the overturning.

Figure 14 shows a flow diagram of a preferred embodiment of the method according to the invention, wherein this embodiment is kept very simple. In a first step 100, a piece good is arranged on the optically transparent turntable 10. For this

purpose, a piece good is gripped with the first conveying device 30 and arranged on a first side surface on the support surface 11 which extends in the X and Y directions. In a step 200, the first side surface facing the turntable of the piece good is scanned with a first optical detection device for determining the X, Y dimensions and an identifier. On the basis of the data obtained, which are usually data from a 3D camera, the X and Y dimensions and, if applicable, the identifier (if one has been applied and recognized on this side surface) are determined. This can be done with the first optical reading device itself or with a control device. In a step 210, a second side surface designed orthogonally to the first side surface is scanned with the second optical reading device for determining the Z dimension and an identifier. Based on the data obtained, as already described above, the Z dimension of the piece good is determined. Unless an identifier could be recognized on the first side surface, an attempt is also made to determine an identifier based on the data obtained.

In a subsequent step 220, it is then determined whether an identifier was determined at step 200 or 210. If this is not the case, in a step 230, the turntable is rotated so that the second optical reading device 62 faces a next orthogonal side wall. The next side surface is scanned and analyzed for an identifier. Thereafter, the process is repeated from step 220 until either an identifier is detected, or all four orthogonal side surfaces are scanned. If no identifier was detected, the piece good is removed from the turntable in a step 240 and returned to step 100. If an identifier was detected, the control device determines a storage location in the storage area 51 in a step 300. This is possible because the control device knows the occupancy of the storage area and the nature and dimensions of the piece good.

After determining the storage area, the piece good resting on the turntable is gripped with the second conveying device in a step 400 and moved to the storage location in the storage area. For this purpose, the second conveying device is moved in the X direction and Y direction into the storage area. After storing the piece good, the method is continued at step 100 until the storage area is filled. The piece goods are then

removed from the storage area, for example, by a clamping gripper of a control unit (not belonging to the device) of a picking apparatus or by moving the storage surface that provides the storage area so that the piece goods are removed from the
5 storage area.

Claims

1. An apparatus (1) for identifying, measuring and positioning piece goods (2), comprising

5 an optically transparent turntable (10) having a support surface (11) for piece goods extending in an X and Y direction of the apparatus, wherein the turntable (10) cooperates with a rotary drive (12) coupled to a control device (20) and is rotatable about an axis of rotation extending in the Z
10 direction, wherein the Z direction extends orthogonally to the X and Y directions, and wherein the X direction corresponds to the longitudinal axis and the Y direction corresponds to the transverse axis of the apparatus,

a first conveying device (30) for arranging a piece good on
15 the support surface (11) of the turntable (10),

a first optical reading device (61) arranged in the Z direction below the turntable (10) and coupled to the control device (20) for detecting the dimensions of a piece good resting on the support surface (11) and an identifier on one
20 side surface of a resting piece good, which side surface faces the support surface (11),

a second optical reading device (62) coupled to the control device (20) for detecting the height of a piece good resting on the support surface (11) and an identifier on a side
25 surface of a resting piece good which side surface is orthogonal to the support surface,

a storage area (51) arranged downstream of the turntable (10) for a plurality of piece goods, wherein the arrangement of the turntable and of the storage area defines the
30 longitudinal axis,

a second conveying device (40) coupled to the control device (20) having a gripping means (45) for piece goods, wherein the gripping means (45) is movable, at least in the X

and Y directions, over the storage area (51), so that piece goods can be arranged side by side in the storage area in the X and/or Y directions,

characterized in that the first conveying device (30)
5 comprises a gripping means (35) which is movable in the X, Y and Z directions.

2. The apparatus (1) for identifying, measuring and positioning piece goods (2) according to claim 1,
10 characterized in that the apparatus comprises a third optical reading device (63) arranged in the Z direction above the turntable and coupled to the control device (20) for detecting the dimensions of the piece good resting on the support surface (11) and/or an identifier on one side surface facing
15 away from the support surface (11).

3. The apparatus (1) for identifying, measuring and positioning piece goods (2) according to claim 1 or 2, characterized in that the apparatus comprises an optical
20 coarse detection device (64) coupled to the control device for determining the spatial orientation of a piece good.

4. The apparatus (1) for identifying, measuring and positioning piece goods (2) according to any of claims 1-3,
25 characterized in that a discarding device (13) is arranged between the turntable (10) and the storage surface (51) for the removal of piece goods.

5. The apparatus (1) for identifying, measuring and
30 positioning piece goods (2) according to any of claims 1-4, characterized in that the first and/or the second conveying device (30, 40) are designed as suction grippers which are movable in the X, Y and Z directions.

6. The apparatus (1) for identifying, measuring and positioning piece goods (2) according to claim 5, characterized in that a suction gripper has two differently dimensioned suction heads (35a, 35b).

7. The apparatus (1) for identifying, measuring and positioning piece goods (2) according to any of claims 1-6, characterized in that the second conveying device (40) is designed as a clamping gripper which is movable at least in the X and Y directions.

8. The apparatus (1) for identifying, measuring and positioning piece goods (2) according to any of claims 1-7, characterized in that the apparatus (1) has a supply device (70) and a position detection device (65) arranged above the supply device in the Z direction.

9. A method for identifying, measuring and positioning piece goods (2), wherein

a) a single piece good is arranged by a first conveying device (30) on a first side surface on a support surface (11) of an optically transparent turntable (10) which support surface extends in the X and Y direction, wherein the first conveying device (30) comprises a gripping means (35) which is movable in the X, Y and Z directions, wherein the turntable (10) cooperates with a rotary drive (12) which is coupled to a control device (20), and which turntable is rotatable about an axis of rotation extending in the Z direction, wherein the Z direction extends orthogonally to the X and Y directions and wherein the X direction corresponds to the longitudinal axis and the Y direction corresponds to the transverse axis of the apparatus,

b) the first side surface is scanned and the X, Y dimensions of the piece good resting on the support surface (11) are detected with a first optical reading device (61) which is arranged below the turntable (10) in the Z direction, 5 and it is determined whether an identifier was detected during the scanning of the first side surface,

c) a second side surface facing the second reading device, which second side surface is designed orthogonally to the first side surface, is scanned and the Z dimension of the 10 piece good resting on the support surface is detected with a second optical reading device (62), and if no identifier was detected on the first side surface, it is determined whether an identifier was detected during the scanning of the second side surface, wherein steps b) and c) can be carried out 15 simultaneously or staggered,

d) in the event that no identifier was detected, the turntable is rotated so that a next side surface, which is perpendicular to the first side surface, faces the second optical reading device, wherein the next side surface is 20 scanned with the second reading device, and it is determined whether an identifier was detected during the scanning of the next side surface,

e) step d) is repeated until three next side surfaces were scanned, or an identifier was detected,

25 f) if no identifier was detected, the piece good is removed from the turntable and sent for further use,

g) as soon as an identifier and all dimensions of the resting piece good are detected, a storage location is determined in a storage area (51), which is arranged 30 downstream of the turntable, by a control device on the basis of the dimensions and/or of the identifier,

h) the piece good is gripped with a gripping means (45) of a second conveying device (40) after determining the storage

location and moved to the storage location, whereby the gripping means (45) is moved in the X and/or Y and Z directions.

5 10. The method for identifying, measuring and positioning piece goods (2) according to claim 9, characterized in that in step b) a side surface is scanned by a third optical reading device (63), which is arranged above the turntable (10) in the Z direction, said side surface facing this reading device
10 (63), and if necessary, the X, Y dimensions of the piece good resting on the support surface (11) are detected and it is determined whether an identifier was detected during the scanning of the side surface.

15 11. The method for identifying, measuring and positioning piece goods (2) according to claim 9 or 10, characterized in that in method step a) the spatial orientation of the piece good held by the first conveying device (30) is determined before arranging the piece good on the support surface (11) of
20 the turntable (10) by means of a coarse detection device (64).

 12. The method for identifying, measuring and positioning piece goods (2) according to claim 11, characterized in that the coarse detection device (64) is designed as an optical
25 reading device and, when determining the spatial orientation, the piece good is scanned in order to detect an identifier.

 13. The method for identifying, measuring and positioning piece goods (2) according to claims 11 or 12, characterized in
30 that the piece good is moved by means of a conveying device (30, 40) such that the piece good rests on a largest side surface on the support surface if it is detected during the determination of the spatial orientation that not a largest

side surface of the piece good held by the first conveying device (30) is facing the support surface.