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54 Titre : Marking assembly and method.

57 Abrégé :

The present invention refers to a marking assembly suitable for providing markings, for example a text, an image, a barcode, or the like, on objects like containers, packages or products. The marking assembly comprises a control unit configured to receive a signal from a sensor and configured to either activate an actuator to move a marking device to an elevated position with an increased speed, or to activate a release device to disengage the actuator, thereby moving the marking device by a counterweight.

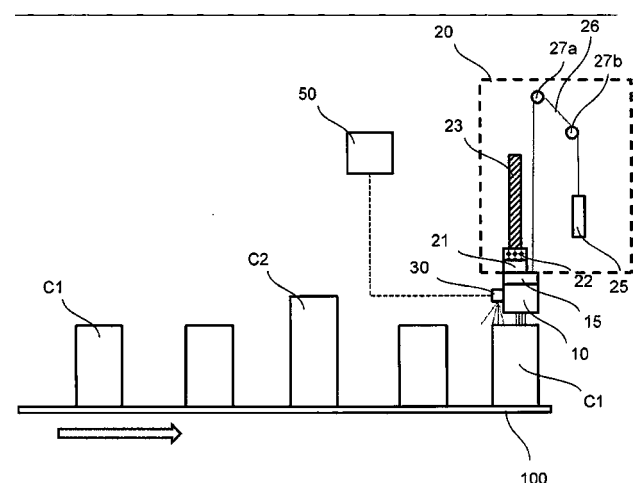


Fig. 1

Marking assembly and method

Technical field

5 The present invention refers to a marking assembly suitable for providing markings, for example a text, an image, a barcode, or the like, on objects like containers, packages or products (hereafter "container") conveyed by a conveyor. Specific examples of such containers are bottles, boxes or
10 parcels.

Background

15 Printing devices for printing a marking on a moving container are known in the art. Conventional print head assemblies usually comprise a motor so as to adjust the height position of the print head relatively to a conveyor so that containers of different heights may be processed.

20 For example, EP 0 534 337 A1 refers to a printing device for printing a marking on objects, which are continuously moved forward, in particular for parcels, wrapped magazine piles or the like. The printing device comprises a transport path alongside of which the objects can be transported at a
25 defined rate of speed. By means of an adjustable matrix printing head, the surface to be printed of the objects can be printed in contactless manner when they pass the printing head. A scanning member, in particular an infrared distance sensor, is arranged at a distance before the printing head
30 and scans the position of the surface to be printed of the objects and tracks the printing head according to the position of the surface to be printed of the objections by corresponding control over and adjustment device of the printing head.

35

Although the device of EP 0 534 337 A1 is suitable for adjusting the position of a print head, a situation may

occur where the scanning member fails to detect an object or to correctly detect the height of such an object. Consequently, the object moved along the transport path will collide with the print head.

5

Another document is US 7,434,902 B2 referring to a printheads and a system using printheads. The printing apparatus comprises a jetting assembly including a plurality of nozzles for ejecting droplets on a substrate moving
10 ~~relative to the jetting assembly and a mechanism for~~ increasing the displacement of the jetting assembly relative to the substrate. Additionally, a sensor is provided, which includes a transmitter mounted on one side of the conveyor and a receiver mounted to an opposite side of the conveyor
15 in a so-called "electric-eye" arrangement. If a substrate conveyed by the conveyor has a height that exceeds the spacing, the beam of light is interrupted and the transmitter sends a signal to a lift actuator so as to raise the mounting rack and the print head clusters above the
20 substrate and also provides a signal to the print head clusters to interrupt the printing process.

Summary of the invention

25 One of the objects of the present invention is to provide a marking assembly which may avoid one of the above-mentioned drawbacks, and/or a marking assembly which reliably processes containers of varying heights.

30 Claims 1 provides a marking assembly according to one aspect of the present invention. Further preferred embodiments are outlined in the dependent claims and in the following description.

35 The marking assembly comprises a marking device, for example an ink jet head, configured to provide a marking on an object passing the marking device. Thus, the marking device is

suitable for providing a marking on an upper surface of an object like a container, in particular a bottle, a box, a parcel or the like.

- 5 In a preferred embodiment, the marking device is disposed so that an object may pass adjacent or below the marking device.

The marking assembly also includes a positioning mechanism, ~~wherein the positioning mechanism comprises an actuator for~~ moving the marking device in a vertical direction. Additionally or separately, the positioning mechanism comprises a counterweight. The actuator may be an electric mechanical actuator.

15

Further, the marking assembly comprises a release device, which may according to a specific embodiment be a solenoid valve, for disengaging the actuator. A sensor is provided on the marking device or the positioning mechanism, being
20 suitable for detecting an object approaching the marking device.

For example, the sensor may face vertically downwards. Thus, the sensor is suitable for detecting a container present in
25 an area below the sensor. The sensor may be for example an optical sensor, an ultrasound sensor, a radar sensor, or the like.

Additionally, the marking assembly comprises a control unit
30 configured to receive a signal from the sensor and to either activate the actuator moving with an increased speed or to activate the release device for disengaging the actuator.

Consequently, the present invention provides a marking
35 assembly with safety features for avoiding a collision with a container. If the sensor detects a container which would collide with the print head, since the position of the

marking device is not correctly adjusted, a first step could be to activate the actuator, thereby moving the marking device with high or even maximum speed in a vertical direction so as to avoid collision. If the actuator fails
5 to move the marking device or if the controller recognizes that the acceleration which could be provided by the actuator will not be sufficient for avoiding a collision, the control unit is configured to send a signal to the release device which disengages the actuator, thereby moving
10 the marking device by the counterweight.

Thus, a collision can be reliably avoided, even if unforeseen circumstances occur, like power failure or a defect of the actuator.

15

According to a preferred embodiment, the sensor is a diffused sensor. The diffused sensor may send out a light beam that diffuses in all directions. If any portion of a container has a height that exceeds the predetermined
20 height, the light beam is interrupted and the sensor is triggered. Subsequently, the sensor may send a signal to a control unit, which is preferably a programmer logical controller (PLC). The control unit receives the signal and may send a signal to the actuator to move up with a maximum
25 speed in order to avoid a collision, or to activate the released device to disengage the actuator.

According to a preferred embodiment, the actuator is a servomotor, in particular a servomotor with a mechanical
30 spindle axis, which is particularly useful for providing a high precision and high rotation rate.

According to a preferred embodiment, the control unit is configured to activate the release device, if activating the
35 actuator fails. Thereby, a collision of an object with the marking device may be reliably avoided.

The control unit may be configured to detect a power failure so that the control unit activates the release device to disengage the actuator, thereby moving the marking device by the counterweight. Thus, even under those circumstances,
5 a collision may be reliably avoided.

In another preferred embodiment, the control unit is configured to detect failure of the sensor so that the control unit activates the actuator to move the marking
10 ~~device to an elevated position.~~

The control unit may also be configured to detect a failure of the actuator so that the control unit activates the release device to disengage the actuator, thereby moving the
15 marking device the counterweight.

Thus, even under those circumstances, a collision may be reliably avoided.

20 The marking device is preferably provided on a beam movably guided by a vertical guide, wherein the actuator and/or the release device are mounted on the beam.

According to another modification, the above mentioned
25 increased speed is a maximum speed of the actuator.

The control unit is, according to a preferred embodiment, a centralized control unit. According to a further embodiment, the control unit may be a decentralized control unit, which
30 is in particular provided on the marking device or the actuator. According to a preferred embodiment, the control unit is a programmer logical controller (PLC). Therefore, the control unit may quickly receive and send commands to the corresponding elements of the device.

35

The present invention further refers to a conveyor comprising a conveying element for conveying objects and a

marking assembly according to any of previous aspects. Similar positive effects may be obtained by a conveyor comprising the marking assembly.

5 Further, the present invention refers to a method for adjusting a position of a marking device of a marking assembly. According to a preferred option, a marking assembly according to any of claims 1-10 may be used with this method. The method comprises the following steps:

~~10 Moving an object, in particular a container, in a conveying direction, Detecting the object by an optical sensor provided on or in proximity to the marking device of the marking assembly, and determining to activate an actuator an increased speed, or to activate a release device for~~
15 disengaging the actuator, thereby elevating the marking device by a counterweight connected to the marking device.

Brief description of the drawings

20 The invention may be better understood by reference to the following specification and taken in conjunction with the accompanying drawings.

Fig. 1 is a schematic drawing showing a preferred
25 embodiment of the present invention

Detailed description of a preferred embodiment

A preferred embodiment of the present invention is hereafter
30 described in further detail. The description and the accompanying schematic drawing are to be construed by ways of example and not of limitation. In particular, modifications of specific elements of the preferred
embodiment described hereafter may be combined with other
35 modifications so as to provide further embodiments of the present invention.

Fig. 1 schematically shows a conveyor 100 comprising a marking assembly according to an embodiment of the present invention. In particular, the conveyor 100, which may comprise a conveyor belt or rollers for moving containers C1, C2 (objects) in a conveying direction (arrow in Fig. 1) is provided, wherein a print head 10 (marking device) of the marking assembly is configured to provide a marking on an upper surface of the containers C1, C2.

~~10 The print head 10, which may be an ink-jet printing head, comprises printing nozzles, which are facing vertically downwards. The print head 10 is attached to a rack or beam 15 extending transversely over the conveyor 100.~~

15 The marking assembly further includes a positioning mechanism 20, which comprises a servo motor (actuator) 21 for moving the print head 10 upwards and downwards along a guide rail 23. The guide rail 23 extends in a vertical direction and provides guidance for the beam 15 when moving
20 upwards and downwards.

A releasing device 22 is provided on the beam 15 and attached on the electric mechanical actuator. The servomotor is coupled on the electric mechanical actuator., which is
25 according to the preferred embodiment a solenoid valve. The solenoid valve 22 is configured to disengage the pinterhead arm.

The positioning mechanism 20 further comprises a
30 counterweight 25, which is connected to the beam 15 via a (steel) cable 26. The cord 26 extends from an upper portion of the beam 15, is deflected by guiding rollers 27a, 27b and is connected to an upper portion of the counterweight 25. The counterweight 25 is conventionally used for
35 balancing the movement of the beam 15, on which the print head 10 is mounted.

An sensor 30, which may according to the present embodiment a diffused optical sensor or another type of sensor (like, for example, an ultrasound sensor, a radar sensor, or the like), is attached to the print head 10, or, according to
5 another modification, to the beam 15 or another portion of the positioning mechanism 20. In all configurations, the sensor 30 is positioned at an upstream side of the print head 10 and in proximity thereto.

~~10 The sensor 30 is configured to scan an area in front of the print head 10 so that the sensor 30 may detect a container C1, C2 approaching the print head 10. If the distance obtained by the sensor 30 is within a predetermined range or on a predetermined position, the container C1 may pass
15 below the print head 10, which again provides a marking on an upper surface of the container C1. Under these circumstances, a control unit 50 of the marking assembly determines that no repositioning of the beam 15 carrying the print head 10 is required.~~

20

The control unit 50 is in the present case a centralized control unit provided for example on the printing head 10 or on any portion of the positioning mechanism 20, like on the servo motor 21. In other modifications, the control unit
25 may be a main control unit of the conveyor 100. However, according to a further embodiment, the control unit 50 may also be a decentralized control unit.

The predetermined range/ position is either entered manually
30 by an operator or obtained by a corresponding sensor (not shown), like a laser sensor, located in the conveyor 100 at an upstream position of the print head 10.

The embodiment shown in Fig. 1 provides a configuration,
35 wherein a plurality of containers C1 is forwarded by the conveyor 100. The containers C1 have substantially the same

height so that a printing operation may be performed without repositioning the print head 10.

5 If a container having a different height, like the container C2 shown in Fig. 1, approaches the print head 10, the print head 10 is usually repositioned on the basis of the predetermined position obtained or entered for a newly arriving container so that a marking may also be provided on an upper portion of the container C2.

10

However, if the height detection of the conveyor 100, which usually obtains the predetermined position well ahead of the print head 10 fails, or if some other unforeseen circumstances occur, like a defect of the sensor for
15 obtaining the predetermined position or power failure, the container C2 having an increased height in comparison to the previous container C1 may approach the print head 10 which is still at a height position for printing an upper surface of a container C1 having a lower height.

20

Once the container C2 approaches the print head 10, the sensor 30 detects the container C2 and sends a signal to the control unit 50. Since the print head 10 is in a position which is not within the predetermined range and which would
25 lead to a collision with an upper portion of the container C2, the control unit 50 may choose between two options.

In particular, the control unit 50 may according to a first option send a command to the servo motor 21 for elevating
30 the print head 10 in a vertical direction with maximum speed, thereby avoiding a collision with the container C2 having an elevated height.

The control unit 50 may, however, evaluate that the servo
35 motor 21 is not working properly, in particular if a command is send to the servo motor 21 and the control unit 50 receives no feedback from the servo motor 21. Alternatively,

the control unit 50 may have detected a power failure or the control unit 50 may receive a signal from the collision sensor 30 that the collision sensor is not working properly. Under these circumstances, the control unit 50 detects a
5 failure, for example due to a power failure or an overcurrent.

Alternatively, the control unit 50 may receive a feedback from the servo motor 50, but evaluates that the maximum
10 ~~speed will not be sufficient to avoid a collision with the~~ approaching container C2.

In the abovementioned cases, where the control unit 50 evaluates that driving the servo motor 21 will not avoid a
15 collision, the control unit 50 activates, according to a second option, the release device 22, thereby disengaging the printerhead arm.

Once the servo motor 21 is disengaged, the weight of the
20 counterweight 25 lifts the print head 10 in a vertical direction. Consequently, no additional motor is required, but the movement of the beam 15 supporting the printing head 15 is initiated only on the basis of the weight of the counterweight 25. The counterweight 25 moves downwards,
25 until the counterweight reaches a bumper that alleviates the impact of the counterweight.

Since the present embodiment provides the above mentioned options, and the control unit 50 is configured to perform
30 either option 1 or option 2, a collision of a container with the print head 10 can be reliably avoided.

Claims

1. Marking assembly, comprising:

5 a marking device (10), in particular a print head (10),
configured to provide a marking on an object passing
the marking device (10),

10 a positioning mechanism (20), the positioning mechanism
~~comprising an actuator (21) for moving the marking~~
device (10) in a vertical direction, the positioning
mechanism further comprising a counterweight (25),

15 a release device (22), in particular a solenoid valve,
for disengaging the actuator (21),

20 a sensor (30), the sensor (30) being suitable for
detecting an object, in particular the height of the
object, approaching the marking device (10), and

a control unit (50) configured to receive a signal from
the sensor (30) and configured to

25 either activate the actuator (21) to move the marking
device (10) to an elevated position with an increased
speed or

to activate the release device (22) to disengage the
actuator (21), thereby moving the marking device (10)
by the counterweight (25).

30

2. Marking assembly according to claim 1, characterized
in that the sensor (30) is an optical sensor, in
particular a diffused optical sensor.

35 3. Marking assembly according to any of the previous
claims, characterized in that the actuator (21) is a

servomotor, in particular a servomotor with a mechanical spindle axis.

4. Marking assembly according to any of the previous
5 claims, characterized in that control unit (50) is configured to activate the release device (22), if activating the actuator (21) fails.
5. Marking assembly according to any of the previous
10 ~~claims, characterized in that the control unit (50) is~~ configured to detect a power failure so that the control unit (50) activates the release device (22) to disengage the actuator (21), thereby moving the marking device (10) by the counterweight (25).
- 15 6. Marking assembly according to any of the previous claims, characterized in that the control unit (50) is configured to detect failure of the sensor (30) so that the control unit (50) activates the actuator
20 (21) to move the marking device (10) to an elevated position.
7. Marking assembly according to any of the previous
25 claims, characterized in that the control unit (50) is configured to detect a failure of the actuator (21) so that the control unit (50) activates the release device (22) to disengage the actuator, thereby moving the marking device (10) by the counterweight
30 (25).
8. Marking assembly according to any of the previous
35 claims, characterized in that the marking device (10) is provided on a beam (15) movably guided by a vertical guide (23), wherein the actuator (21) and/or the release device (22) are mounted on the beam (15).

9. Marking assembly according to any of the previous claims, characterized in that the increased speed is a maximum speed of the actuator (21).
- 5 10. Marking assembly according to any of the previous claims, characterized in that the control unit (50) is a centralized control unit.
- 10 11. Conveyor (100) comprising a conveying element for conveying objects and a marking assembly according to any of the previous claims.
12. Method for adjusting a position of a marking device of a marking assembly, in particular a marking assembly according to any of claims 1-10, the method comprising the steps of:
- 15
- Moving an object, in particular a container (C1, C2), in a conveying direction,
- 20
- Detecting the object (C1, C2) by an sensor (30) provided on or in proximity to the marking device (10) of the marking assembly, and
- 25
- determining to activate an actuator (21) for moving the marking device (10) to an elevated position with an increased speed, or to activate a release device (22) for disengaging the actuator (21), thereby elevating the marking device (10) by
- 30
- a counterweight (25) connected to the marking device (10).
13. Method according to claim 12, wherein activating the release device (22) is determined, if activating the
- 35
- actuator (21) fails or if a failure of the actuator (21) is detected.

14. Method according to claim 12 or 13, wherein activating the release device (22) is determined, if a power failure is detected.
 - 5 15. Method according to any of claims 12-14, wherein activating the actuator (21) to move the marking device (10) to an elevated position is determined, if a failure of the sensor (30) is detected.
-

Abstract

The present invention refers to a marking assembly suitable for providing markings, for example a text, an image, a barcode, or the like, on objects like containers, packages or products. The marking assembly comprises a control unit configured to receive a signal from a sensor and configured to either activate an actuator to move a marking device to an elevated position with an increased speed, or to activate a release device to disengage the actuator, thereby moving the marking device by a counterweight.

(Fig. 1)

Fig. 1

