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(54) **Buffer device for handling a material in the form of a web**

(57) The invention relates to a buffer device (20) adapted to receive a web (2) from a relative source (4) and arranged upstream, with respect to an advancement direction of said web (2) along a relative feed path (FP), of driving means (7) intermittently actuatable to alternately move, and terminate movement of, the web (2) at an operating station (5) arranged further downstream thereof; the buffer device comprising a first and a second group (21a, 21b) of guide rollers (22a, 22b) having different diameters, wherein each roller (22a) belonging to the first group (21a) is paired with a corresponding roller (22b) in the second group (21b) to form a couple of same-diameter rollers; the buffer device (20) comprising means (24) for kinematically coupling the first and second groups (21a, 21b) to one another, so that they are movable in opposite directions relative to one another and symmetrically relative to a central portion (23) of the buffer device (20); and by comprising actuating means (26) for energising the kinematic coupling means (24) to selectively vary the mutual distance of the first and second groups (21a, 21b).

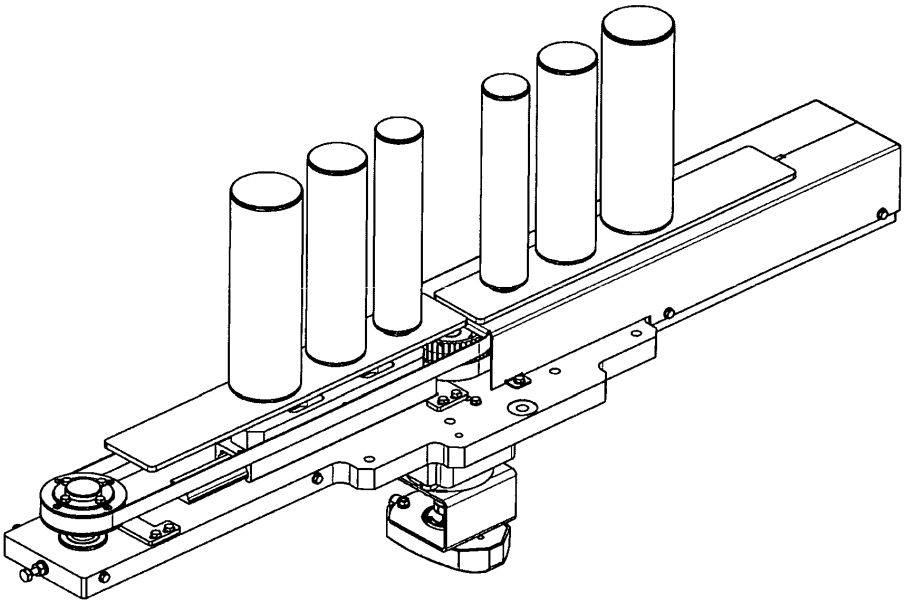

FIG. 3

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## Description

TECHNICAL FIELD

**[0001]** The present invention relates to a buffer device for handling a material in the form of a web, as is the case, in particular, with a web of labelling material in a labelling machine.

**[0002]** In greater detail, the invention may refer to both labelling machines handling a web material that carries self-adhesive labels (also known as pressure-sensitive labels, or PSL) to be stuck on the containers and to so-called roll-feed labelling machines, i.e. those adapted to receive a strip of labelling material which is to be cut into portions of a predetermined lengths, which are destined to be wound about the containers, where they are subsequently sealed to form sleeve labels.

**[0003]** However, this is not intended to limit the scope of protection of the claims attached, and the buffer device disclosed herein may conveniently find application in other types of machines, such as those for packaging (namely, wrapping) articles in a film-like material supplied from a roll.

**[0004]** Typically, labelling machines for applying self-adhesive labels onto containers comprise a supply reel of a web bearing the labels and a unit for drawing the web from the supply reel and feeding it to an affixing station, wherein self-stick labels are peeled off the web and stuck to containers being carried by a carousel.

**[0005]** In particular, the carousel is driven by a motor so as to sequentially place each individual container to be labelled at an affixing station of the labelling machine.

**[0006]** A driving roller of the labelling machine powered by a corresponding motor draws the web off the supply reel and enables the feeding thereof to the downstream stages of a) application of the labels and b) recovery/disposal of the bare web off which the labels have been peeled.

**[0007]** Generally, containers conveyed to and through the affixing station advance in an intermittent (stop-and-go) fashion, so that each container stands at the affixing station (e.g. at the blade or bar enabling the peeling of labels off the carrier web) for an amount of time sufficient to enable sticking of each label to the surface of a corresponding container. The labelled container subsequently leaves the affixing station.

**[0008]** Besides, even when containers are advanced continuously along a path defined, at least in the proximity of the affixing station, by the periphery of a carousel, the areas on the respective outer surfaces of two consecutive containers to which labels are to be stuck shall however be slightly spaced apart from one another. In any case, the pitch between two consecutive containers on the carousel shall generally be greater than the pitch between two consecutive labels on the web.

**[0009]** Accordingly, the web carrying the self-adhesive labels has to be fed to the affixing station in a manner such as to account for this discrepancy, so that the peeling off of each label is timed with the arrival of a container to be labelled at the affixing station.

**[0010]** To this purpose, the drawing/feeding unit of the labelling machine therefore generally comprises push/pull rollers capable of causing the portion of the web approaching the affixing station to momentarily stop and then resume its motion, wherein the push/pull rollers are actuated in time with the progression of areas to be labelled on the containers travelling on the carousel.

**[0011]** On the other hand, the web carrying the labels is instead continuously unwound from its relative reel through operation of a motor driving a drawing roller of the drawing/feeding unit. As a consequence, different portions of the carrier web being driven across the drawing/feeding unit are subjected to different dynamics: while the portion of the web proximal to the affixing station is intermittently stopped and driven on, the portion of the web being unwound off the supply reel and fed into the drawing/feeding unit advances in a continuous manner, albeit generally at a variable speed.

**[0012]** Tension exerted on the carrier web due to pull by drawing roller, especially in combination with the speed fluctuations and non-homogeneity described above, may cause undue stretching and deformation of the carrier web and labels borne by it, especially with particularly elastic, fragile and/or thin material, which may consequently break.

**[0013]** The occurrence of a breakage results in the labelling machine having to be stopped, so that the broken portion of the web may be disposed of and the intact carrier web may be advanced into a correct working configuration again.

**[0014]** Similar drawbacks can be encountered when using roll-feed labelling machines. There are, in fact, a number of conditions in which speed differentials may affect the labelling material web, and which need to be taken into account.

**[0015]** In fact, all circumstances under which different portions of the labelling material web (e.g. at the feed roll and at the application station) may be made to travel at significantly different speeds may cause damages, breakages and so forth.

**[0016]** By way of example, the operations by which the leading edge of a new portion of labelling material is spliced onto the trailing edge of a first portion of labelling material which has nearly been used up generally cause a speed differential, whereby the new leading edge needs to be accelerated dramatically. Furthermore, other processes - such as the in-line printing of labels - may result in speed differentials in the labelling material web as it is being fed to the labelling machine. It is, however, desirable that the rate of breakages induced by these speed differentials be kept at a minimum and that the complexity of the gearing elements through which the web passes along its pathway be reduced, so that, in any case, resuming operation in case of a breakage can be as little time-consuming as possible. A reduction in the breakage rate and in the gearing complexity also advan-

tageously results in a reduction of both operating and production costs.

**[0017]** For all the above reasons, the drawing/feeding unit of a PSL labelling machine is typically provided with buffer devices for compensating discontinuities and non-homogeneity in the advancing speed of the carrier web, such as a chamber for accommodating a swollen length of web, or the like.

**[0018]** In buffer devices of this type, a loop of web is formed between the portion of web advancing continuously and the portion of web moving in start-and-stop fashion. This loop changes its length as the web stops or moves, and air is normally blown against a side of the web into a buffer box for containment. Further, idler rollers and dancer rollers are often provided, in combination with said buffer devices, in order to ensure that the carrier web is suitably tensioned at all times and under all circumstances.

**[0019]** This solution is however expensive, bulky and may pose maintenance problems.

**[0020]** Other types of buffers have also been proposed for roll-feed labelling machines.

**[0021]** German utility model DE 20016315 U discloses a more compact type of buffer device comprising a first and a second group of guide rollers having different diameters, wherein each roller belonging to a group of rollers is associated with a corresponding roller in the other group of rollers to form a couple of same-diameter rollers; the couples of rollers are arranged such that diameter increases with the distance from a central portion of the buffer device. In greater detail, while the first group of rollers is fixed, e.g. to a support plate, the second group of rollers is arranged slidable, for example along a linear guide, so as to be movable relative to the first group. Furthermore, the buffer device comprises elastic means interposed between the first and second groups of rollers for restoring their relative distance.

**[0022]** However, while more compact with respect to other solutions known in the art, the device buffer disclosed by DE 20016315 U may still cause problems, due to its non-symmetrical configuration, when it has to be moved or when the labelling machine has to be reconfigured. Besides, when the labelling web material is changed to meet production requirements, the tension exerted by the elastic means may not be fully compatible with a varied thickness, flexibility, or general elastic properties of the web, thus potentially causing operation issues.

**[0023]** The need is therefore felt in the art for a buffer device with a compact design and that is easier to adapt to different configuration of a labelling machine, in particular as concerns variations in the type and mechanical (elastic) properties of the web material handled.

**[0024]** It is an object of the present invention to provide a buffer device for handling a material in the form of a web, particularly in labelling machines, which makes it possible to satisfy the above need in a straightforward and low-cost manner. This object is achieved by a buffer device as claimed in claim 1.

**[0025]** Further features and advantages of the present invention will be better understood from the description of a preferred embodiment, which is given below by way of a non-limiting illustration, with reference to the accompanying drawings, in which:

Figure 1 shows a schematic top view of a labelling machine provided with a buffer device according to the invention;

Figure 2 shows a larger-scale view of the buffer device of Figure 1; and

Figure 3 shows a schematic prospective view, with parts removed for a clearer identification of internal kinematic coupling means, of the buffer device of Figures 1 and 2.

**[0026]** Number 1 in Figure 1 indicates as a whole a labelling machine of the type for receiving a labelling material web 2 travelling along a feed path FP and intended for being cut into predetermined lengths, which are to be wound in a sleeve arrangement (so-called sleeve labels) about articles 3 travelling along a respective article path AP.

**[0027]** Labelling machine 1 comprises a supply reel 4 off which a labelling material web 2 is unwound and fed along feed path FP towards an affixing station 5 of labelling machine 1.

**[0028]** Labelling machine 1 further comprises means 6 for unwinding labelling material web 2 off supply reel 4, consisting e.g. of a driving roller, which is positioned, with reference to a main travelling direction of backing web 2 along feed path FP, downstream of supply reel 4, and which is operatively coupled with a shaft of a variable speed motor (not shown), so that the linear velocity imparted to backing web 2 may be controlled in a known manner.

**[0029]** Furthermore, labelling machine 1 comprises means (not shown) for cutting the labelling material web 2 into predetermined lengths and for winding said lengths about articles 3 to form corresponding sleeve labels.

**[0030]** An example of said means for forming and applying sleeve labels can be found e.g. in WO2011018806 in the name of the present applicant.

**[0031]** Advantageously, labelling machine 1 further comprises a buffer device 20, which shall be described, in the following, in greater detail and with reference to Figures 2 and 3, and which is designed for controlling the tension exerted on the labelling material web 2 in operation.

**[0032]** Buffer device 20 comprises a first and a second group 21a, 21b of guide rollers 22a, 22b having different diameters, wherein each roller 22a belonging to the first group 21a is paired with a corresponding roller 22b in the second group 21b to form a couple of same-diameter rollers.

**[0033]** In the embodiment shown in the Figures, each group 21a (21b) comprises three guide rollers 22a (22b).

**[0034]** Preferably, the shafts about which the idle guide rollers 22a, 22b are rotatably mounted all lie in a same plane substantially orthogonal to the plane of Figure 2. In particular, rollers 22a, 22b are arranged such that roller diameter increases with the distance from a central portion 23 of buffer device 20.

**[0035]** Web 2 is routed about guide rollers 22a, 22b so that it is constantly tensioned by buffer device 20 and oscillations and differences in the speed of different portions of the web 2 may be efficiently compensated for. In the embodiment illustrated, web 2 is routed alternately about a guide roller of first group 21a and a guide roller of second groups 21a, 21b, their sequential order being such that the roller diameter first decreases from maximum to minimum, then increases back again from minimum to maximum (see Figure 2).

**[0036]** Buffer device 20 advantageously comprises (see Figure 3) means 24 for kinematically coupling first and second groups 21a, 21b to one another, so that they are movable in opposite directions relative to one another and symmetrically relative to central portion 23.

**[0037]** By way of example, first and second groups 21a, 21b are mounted rotatable about respective axes on corresponding first and second support blocks 25a, 25b slidable along a linear track (not shown) extending along a longitudinal axis of buffer device 20, kinematical coupling means 24 comprising a symmetrical synchronous belt system adapted to operatively link first and second support blocks 25a, 25b.

**[0038]** Furthermore, buffer device 20 advantageously comprises actuating means 26 for energising kinematic coupling means 24 to selectively vary the mutual distance of first and second groups 21a, 21b of rollers.

**[0039]** For example, actuating means 26 may comprise a rotary pneumatic actuator, i.e. a device capable of converting energy supplied in the form of compressed air into rotary motion which, in turn, actuates kinematic coupling means 24, thereby causing a symmetrical displacement of first and second groups 21a, 21b of rollers relative to central portion 23.

**[0040]** By selectively varying, through actuation of kinematical coupling means 24, the relative distance between first and second groups 21a, 21b of rollers, the tension exerted on web 2 is also consequently varied. This advantageously makes it possible for operators to promptly and easily adapt the entity of the tension exerted on web 2 to the relative properties (flexibility, thickness, etc.).

**[0041]** In practice, rotary pneumatic actuator 26 shall apply on labelling material web 2 a tension which depends on the value of pressure set, buffer device 20 consequently absorbing and yielding labelling material web 2 at a substantially constant tension.

**[0042]** Preferably, buffer device 20 may comprise a sensing device 27 operatively coupled with actuating means 26, e.g. a rotary potentiometer or an encoder arranged at an end of a shaft of the rotary pneumatic actuator described above, and capable of detecting and displaying/communicating to a receiving (control) unit (not shown) the current buffer load condition in real time.

**[0043]** Variations in the tension set-point (i.e. in the pressure set-point for rotary pneumatic actuator 26) should be required only for extreme differences in label size and structure.

**[0044]** A signal from sensing device 27 may advantageously be employed by said control unit for monitoring and/or control purposes.

**[0045]** The advantages of the buffer device according to the present invention will be clear from the above description.

**[0046]** In particular, because the distance and relative motion of roller groups 21a, 21b may be finely tuned through selective actuation of the relative kinematic coupling means 24, the tension exerted by buffer device 20 upon web 2 can effectively be tailored on factual operational requirements, depending e.g. on the nature and properties of the web material employed, of the current operative conditions (e.g. speed, which may have to be varied, in use, for production purposes).

**[0047]** Furthermore, buffer device 20 is compact and symmetrical, which makes it easy for the user to modify its orientation and to adapt it to different configurations of a labelling machine, possibly with the sole need of a number of additional routing rollers. Accordingly, the overall flexibility of the labelling machine including a buffer device according to the invention is advantageously enhanced.

**[0048]** Also, buffer device 20 can be motorised to reduce inertia-based stressing of the labelling material web 2 above the preset tension, which may become relevant when large and aggressive movements are required, this because, by virtue of buffer device 20 according to the invention, roller clusters can advantageously be both pushed closer to one another and pulled farther away from each other, which enables a better and more precise compensation of large speed differentials.

**[0049]** Clearly, changes may be made to the buffer device as described and illustrated herein without, however, departing from the scope of protection as defined in the accompanying claims.

## Claims

1. A buffer device (20) adapted to receive a web (2) from a source (4), said web (2) being moved by driving means (7) actuatable to feed said web (2) along a relative feed path (FP) towards an operating station (5) arranged downstream of said buffer device (20); the buffer device comprising a first and a second group (21a, 21b) of guide rollers (22a, 22b) having different diameters, wherein each roller (22a) belonging to the first group (21a) is paired with a corresponding roller (22b) in the second group (21b) to form a couple of same-diameter rollers; **characterised by** comprising means (24) for kinematically

coupling said first and second groups (21a, 21b) to one another, so that they are movable in opposite directions relative to one another and symmetrically relative to a central portion (23) of the buffer device (20); and by comprising actuating means (26) for actuating said kinematic coupling means (24) to selectively vary the mutual distance of said first and second groups (21a, 21b).

2. The buffer device according to Claim 1, **characterised in that** said guide rollers (22a, 22b) are rotatably mounted about respective shafts all lying in a same plane transversal to said advancement direction of said web (2), said guide rollers (22a, 22b) being arranged such that roller diameter increases with the relative distance from said central portion (23).

3. The buffer device according to Claim 1 or 2, **characterised in that** said first and second groups 21a, 21b are mounted on corresponding first and second support blocks (25a, 25b) linearly slidable along a longitudinal axis of the buffer device (20) and **in that** said kinematical coupling means (24) comprise a symmetrical synchronous belt system adapted to operatively link said first and second support blocks (25a, 25b).

4. The buffer device according to any one of Claims 1 to 3, **characterised in that** said actuating means (26) comprise a rotary pneumatic actuator adapted to actuate said kinematic coupling means (24) to cause a symmetrical displacement of said first and second groups (21a, 21b) relative to said central portion (23).

5. The buffer device according to any one of Claims 1 to 4, **characterised by** comprising a sensing device (27) operatively coupled with said actuating means (26) and capable of detecting and communicating to a receiving unit the current buffer load condition.

6. A labelling machine (1) comprising a buffer device (20) as defined in any one of Claims 1 to 5.

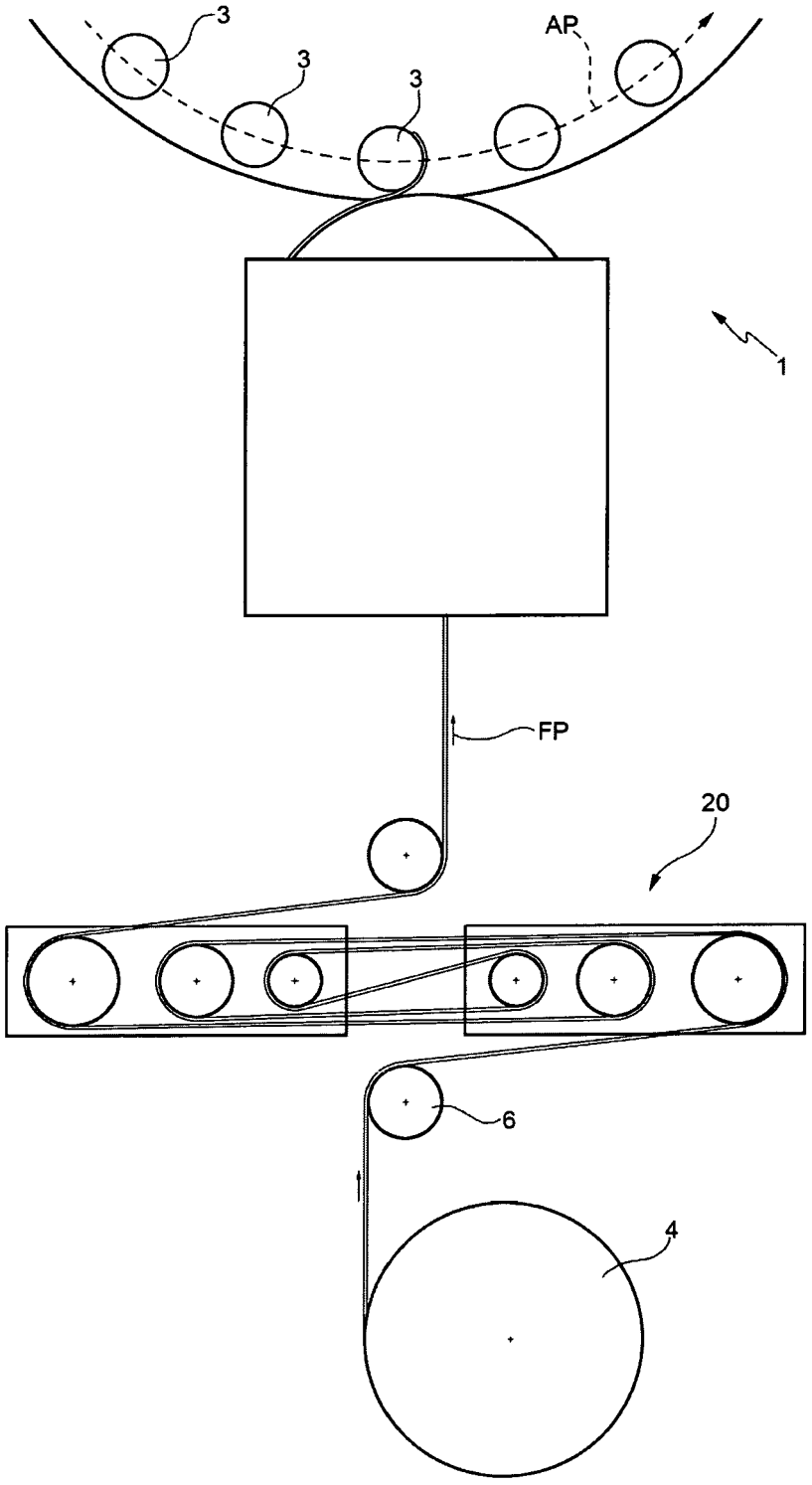


FIG. 1

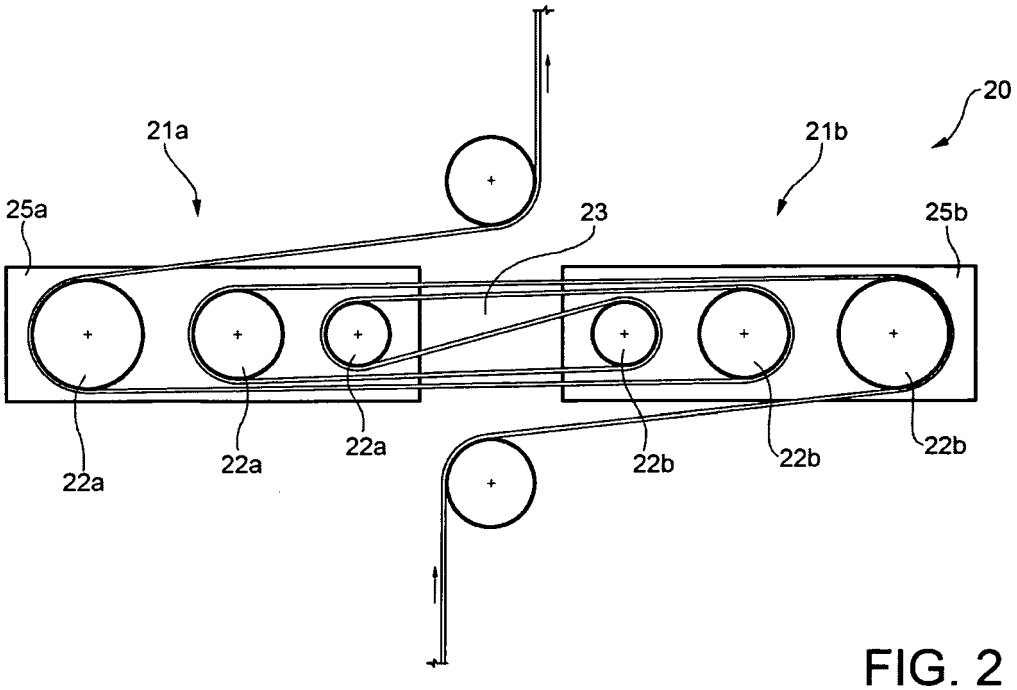


FIG. 2

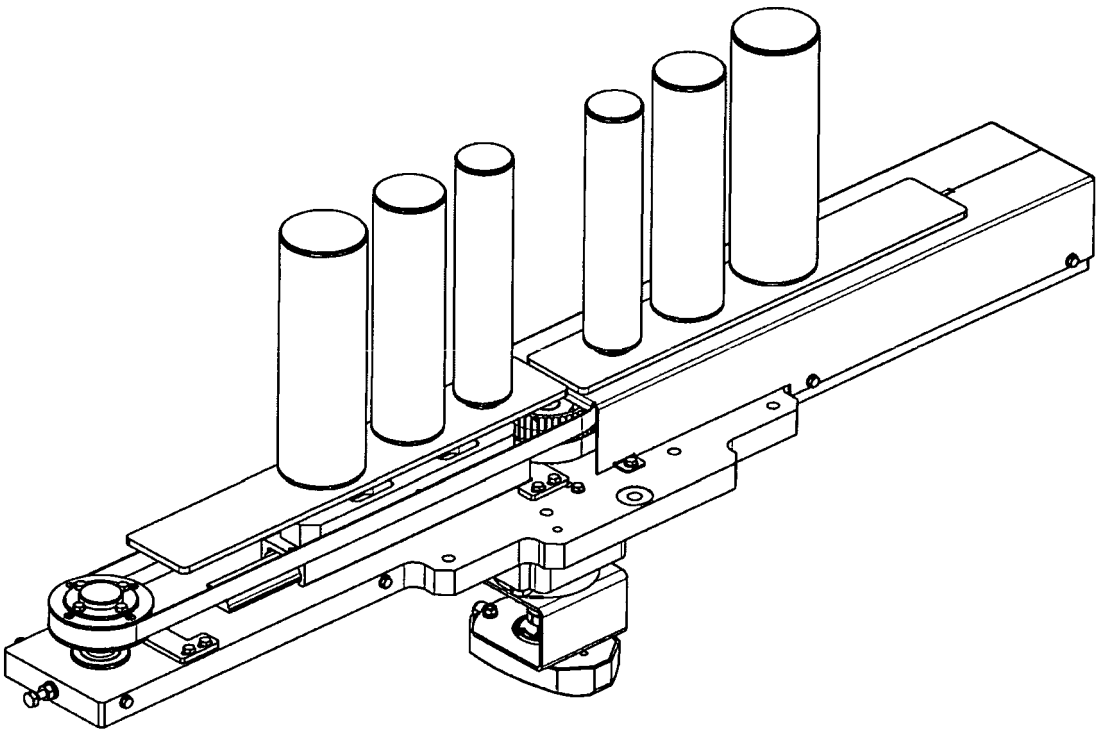

FIG. 3

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# EUROPEAN SEARCH REPORT

Application Number
EP 12 42 5155

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 28 January 2013 | Haaken, Willy |

CATEGORY OF CITED DOCUMENTS

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 42 5155

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