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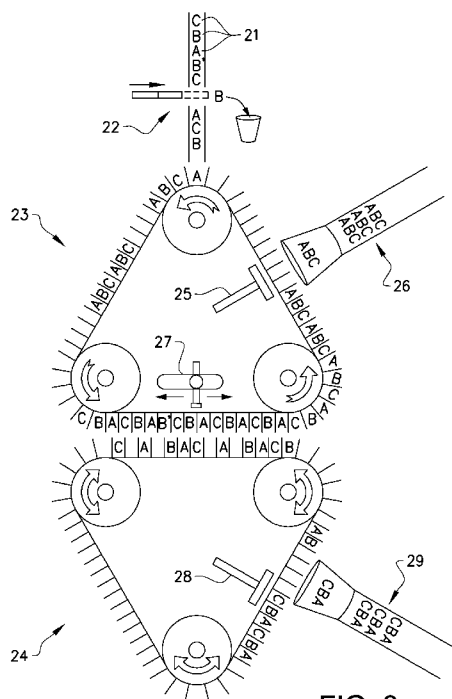


FIG. 3

(57) Abstract: The invention relates to a method for providing packages comprising absorbent articles such as diapers, sanitary napkins, panty liners, incontinence pads or similar. The absorbent articles being made by a production line (1) that is arranged to manufacture unique absorbent articles in a specific sequence. Each package comprising one or more repeating series of absorbent articles, wherein each series comprises at least one unique absorbent article being different from at least one of the remaining absorbent articles in the series. The method comprises removing an absorbent article of a series of absorbent articles from the production line (1), and providing a replacement manufacturing order to the production line (1) for manufacturing a replacement absorbent article having the same characteristics as the removed absorbent article for subsequent completion of the incomplete series associated with the removed absorbent article. The invention also relates to a corresponding arrangement for providing packages.

Title

Method and arrangement for providing packages comprising absorbent articles

TECHNICAL FIELD

The invention relates to a method and an arrangement for providing packages comprising absorbent articles such as diapers, sanitary napkins, panty liners, incontinence pads or similar. The absorbent articles are made by a production line being arranged to manufacture unique absorbent articles in a specific sequence. Each package comprises one or more repeating series of absorbent articles, wherein each series comprises at least one unique absorbent article being different from at least one of the remaining absorbent articles in the series.

10 BACKGROUND ART

Absorbent articles such as hygiene products are produced in a production line comprising for instance a converting machine where different materials are added in sequence and separated by a cut to form individual products. After the converting, the products are collected/stacked in a stacker unit. This unit collects the products, compresses and transfers them to a packaging machine where the final customer package is made.

The production line has a quality control system that constantly monitors the production. If any product and/or material has an error compared to specification it will be rejected at the rejection station of the production line.

The production line keeps track of where individual product with detected error is. When it reaches the rejection station the product with error is rejected before the products are stacked. All quality accepted products pass the rejection station without action and continue to the stacking process.

If packages comprising at least one absorbent article having a different characteristic than at least one other absorbent article in the package are requested this setup leads to problems. When one product is wasted, for any reason, in the converting line, the intended series of products in the bag become incomplete.

The consequence of this is that either:

- the entire intended series is to be wasted, leading to increased waste numbers for the converting line or
- the packages will comprise varying content, leading to lower customer satisfaction/quality.

This problem applies to all product features that could be made individual for an absorbent article, such as product leg/waist cut shape, product length, print design and product absorbency capacity.

There is thus a need for an improved method for providing packages comprising at least one absorbent article having a different characteristic than at least one other absorbent article in the package.

10 SUMMARY OF THE INVENTION

The object of the present invention is to provide an inventive method for providing packages comprising absorbent articles where the previously mentioned problems are avoided. This object is achieved by the features of the appended claim 1.

Another object of the invention is to provide an arrangement for providing packages comprising absorbent articles. This object is achieved by the features of the appended claim 14.

The invention relates to a method for providing packages comprising absorbent articles such as diapers, sanitary napkins, panty liners, incontinence pads or similar. The absorbent articles are made by a production line being arranged to manufacture unique absorbent articles in a specific sequence. Each package comprises one or more repeating series of absorbent articles, wherein each series comprises at least one unique absorbent article being different from at least one of the remaining absorbent articles in the series. The method comprises:

- removing an absorbent article of a series of absorbent articles from the production line,
- providing a replacement manufacturing order to the production line for manufacturing a replacement absorbent article having the same characteristics as the removed absorbent article for subsequent completion of the incomplete series associated with the removed absorbent article.

An advantage of the method according to the invention is that it is possible to produce repeating series of absorbent articles wherein each series comprises at least one unique

absorbent article which is different from at least one of the remaining absorbent article in the series. Normally, packages of absorbent products comprise the same absorbent product. This means that one product in a series of absorbent articles being rejected can be replaced by any other product following the rejected one. However, if the packages comprise absorbent products which do not have the same characteristics, it is not as easy to replace a rejected absorbent product as the replacement absorbent product has to have the same characteristics as the one rejected.

The method according to the invention allows for insertion of a replacement absorbent article into the specific sequence of absorbent articles being produced by the production line after an absorbent article has been removed. The removal of an absorbent article can be due to a production error or that the product does not match quality requirements. The method provides a replacement manufacturing order to the production line for manufacturing a replacement absorbent article having the same characteristics as the removed absorbent article. The replacement absorbent article is thus positioned between two complete series of absorbent product. The manufacturing of a replacement absorbent article ensures that an incomplete series associated with the removed absorbent article can be completed. Thus, an incomplete series does not have to be discarded or that the removal of a specific absorbent article does not lead to that the series following the one with the discarded article will have incorrect series.

The production line may comprise a first and a second stacker unit for sorting and enabling packaging of absorbent articles into packages comprising one or more repeating series of absorbent articles. When the production line comprises the first and second stacker unit the method comprises:

- supplying finished absorbent articles to the first stacker unit, and;
- supplying the first or the second stacker unit with the replacement absorbent article for subsequent completion of the incomplete series associated with the removed absorbent article.

An advantage of having two stacker units located in close proximity to each other is that it is possible to provide finished articles only to the first stacker unit. This means that the first stacker unit will comprise both complete and incomplete series depending on whether or not

an absorbent article has been removed from a series. The first or the second stacker unit can subsequently be provided with the replacement absorbent article for completing the incomplete series associated with the removed absorbent article. The first stacker unit is arranged to move only in one direction, either clockwise or counter-clockwise. The second
5 stacker unit is arranged to move in both directions and to be able to change between both directions intermittently.

The subsequent completion of the incomplete series associated with the removed absorbent article may in a first aspect of the invention comprise:

- transferring the incomplete series from the first stacker unit to the second stacker unit,
- 10 - supplying the first stacker unit with the replacement absorbent article,
- transferring the replacement absorbent article from the first stacker unit into a position in the incomplete series corresponding to the position of the removed absorbent article to form a complete series in the second stacker unit.

In a first aspect of the invention an incomplete series is transferred from the first stacker unit
15 to the second stacker unit. Thereby only complete series are present on the first stacker unit. When a replacement absorbent article reaches the end of the production line the first stacker unit is supplied with the replacement absorbent article and is arranged to transfer the replacement absorbent article from the first stacker unit into a position in the incomplete series corresponding to the position of the removed absorbent article to form a complete
20 series in the second stacker unit.

The subsequent completion of the incomplete series associated with the removed absorbent article may in a second aspect of the invention comprise:

- transferring the incomplete series from the first stacker unit to the second stacker unit,
- supplying the replacement absorbent article directly from a conveyer belt of a converting
25 machine of the production line to the second stacker unit into a position in the incomplete series corresponding to the position of the removed absorbent article to form a complete series in the second stacker unit.

In a second aspect of the invention an incomplete series is transferred from the first stacker unit to the second stacker unit. Thereby only complete series are present on the first stacker
30 unit. When a replacement absorbent article reaches the end of the production line the second

stacker unit is supplied with the replacement absorbent article. The replacement absorbent article is directly inserted into the position in the series where an absorbent article is missing.

The method may further comprise:

- transporting the complete series from the second stacker unit to a packaging unit connected to the second stacker unit.

The subsequent completion of the incomplete series associated with the removed absorbent article according to a third aspect of the invention may comprise:

- providing the second stacker unit with an absorbent article buffer comprising at least one specimen of each unique absorbent article of the repeating series of absorbent articles;
- transferring an absorbent article having the same characteristics as the removed absorbent article from the absorbent article buffer of the second stacker unit to the first stacker unit into a position in an incomplete series corresponding to the position of the removed absorbent article to form a complete series; and
- refilling the absorbent article buffer by supplying the second stacker unit with the replacement absorbent article.

In a third aspect of the invention the incomplete series is not transferred to the second stacked unit from the first stacker unit. Instead, the second stacker unit is arranged to function as a buffer which is arranged to provide an incomplete series on the first stacker unit with an absorbent article having the same characteristics as the removed absorbent article in order to complete the series. The replacement absorbent article, for which a replacement manufacturing order has been provided as soon as the absorbent article has been rejected, is supplied to the second stacker unit in order to keep buffer levels at a predetermined level. The buffer is preferably built up from complete series at the start of production of a new series. Once a desired number of packages have been completed from the first stacker unit, the remaining complete series in the buffer on the second stacker unit can be packaged such that no complete series are wasted. The complete series on the second stacker unit can either be transferred to the first stacker unit for packaging or remain on the second stacker unit for packaging.

The method may according to the third aspect of the invention comprise:

- transporting the complete series from the first stacker unit to a packaging unit connected to the first stacker unit.

5 The characteristics of the removed absorbent article may be any one of: a printing pattern, an embossing pattern, a dimpling pattern, a cutting shape, a dimension, a size, a capacity performance, and a structural design.

Both the first and second stacker unit may supply complete series to the same packaging unit. Alternative, as mentioned above, the first and/or the second stacker unit is connected to separate packaging units.

10 The method according to all aspects of the invention may comprise:

- monitoring absorbent article manufacturing quality
- deciding to remove an absorbent article of a series of absorbent articles from the production line when an absorbent article does not fulfil predetermined manufacturing quality requirements.

15 The method according to all aspects of the invention may comprise:

- tracking a manufacturing status of each absorbent article within at least part of the production line using at least one register.

The production line comprises a function which keeps track of where each absorbent article is located along the length of the production line. The manufacturing status of each article is registered in at least one register. For instance, if an absorbent article is deemed to be rejected a rejection status is set in the register. The rejection status follows the absorbent article as the article passes through the production line by means of that the rejection status changes position within the register. When the rejection status reaches a rejection station of the production line the rejection station removes the absorbent article from the production line. The register also tracks the characteristics of the absorbent article with the rejection status. In this way the order for a replacement absorbent article comprises all necessary information for the production line to manufacture a replacement absorbent article having the same characteristics as the removed absorbent article.

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A single register may be used for tracking the manufacturing status of an absorbent article along the production line, or a plurality of registers interconnected by data communication means may be used for tracking the manufacturing status of an absorbent article along the production line.

- 5 A register may be one of: a shift register, a data stack, a ring counter and a look-up table.

The invention further relates to an arrangement for providing packages comprising absorbent articles such as diapers, sanitary napkins, panty liners, incontinence pads or similar. The arrangement comprises a production line being arranged to manufacture unique absorbent articles in a specific sequence. Each package comprises one or more repeating series of absorbent articles, wherein each series comprises at least one unique absorbent article being
10 different from at least one of the remaining absorbent article in the series. The arrangement provides a replacement manufacturing order to the production line to manufacture a replacement absorbent article having the same characteristics as the removed absorbent article for subsequent completion of the incomplete series associated with the removed
15 absorbent article upon removal of an absorbent article of a series of absorbent articles.

The arrangement may further comprise a first stacker unit and a second stacker unit for sorting and enabling packaging of absorbent articles into packages comprising one or more repeating series of absorbent articles. The production line is arranged to supply finished absorbent articles to the first stacker unit, and to supply the first or the second stacker unit
20 with the replacement absorbent article for subsequent completion of the incomplete series associated with the removed absorbent article.

The first stacker unit may according to a first aspect be arranged to transfer an incomplete series to the second stacker unit. The first stacker unit is arranged to be supplied with the replacement absorbent article. The first stacker unit is arranged to transfer the replacement
25 absorbent article into a position in the incomplete series in the second stacker unit corresponding to the position of the removed absorbent article to form a complete series.

The first stacker unit may according to a second aspect of the invention be arranged to transfer an incomplete series to the second stacker unit. A conveyor belt of a converting machine of the production line is arranged to directly supply the second stacker unit with the

replacement absorbent article into a position in the incomplete series in the second stacker unit corresponding to the position of the removed absorbent article to form a complete series.

The arrangement according to both the first and second aspect of the invention may register if a series is complete or incomplete and upon registration of an incomplete series, transfers the
5 incomplete series from the first stacker unit to the second stacker unit.

The arrangement may be arranged to transport the complete series from the second stacker unit to a packaging unit connected to the second stacker unit.

The second stacker unit may according to a third aspect of the invention be provided with an absorbent article buffer comprising at least one specimen of each unique absorbent article of
10 the repeating series. The second stacker unit is arranged to transfer an absorbent article having the same characteristics as the removed absorbent article from the absorbent article buffer of the second stacker unit to the first stacker unit in an incomplete series corresponding to the position of the removed absorbent article to form a complete series. The absorbent article buffer is refilled by supplying the second stacker unit with the replacement absorbent
15 article.

According to the third aspect of the invention, a complete series is transported from the first stacker unit to a packaging unit connected to the first stacker unit.

The characteristics of the removed absorbent article may be any of: a printing pattern, an embossing pattern, a dimpling pattern, a cutting shape, a dimension, a size, a capacity
20 performance, and a structural design.

According to all aspects of the invention, both the first and second stacker unit may be arranged to supply complete series to the same packaging unit.

The arrangement may be arranged to monitor absorbent article manufacturing quality, and to decide to remove an absorbent article of a series of absorbent articles from the production
25 line when an absorbent article does not fulfil predetermined manufacturing quality requirements.

Arrangement according to all aspects of the invention, wherein the arrangement is arranged to track a manufacturing status of each absorbent article within at least part of the production line using at least one register.

5 The arrangement may use a single register for tracking the manufacturing status of an absorbent article along the production line, or a plurality of registers interconnected by data communication means for tracking the manufacturing status of an absorbent article along the production line.

A register may be one of: a shift register, a data stack, a ring counter and a look-up table.

The arrangement displays the same advantages as the method.

10 BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 schematically discloses a converting machine of a production line according to the invention;

Figure 2a schematically discloses a flow chart showing a first example of providing a replacement manufacturing order;

15 Figure 2b schematically discloses a flow chart showing a second example of providing a replacement manufacturing order;

Figure 3 schematically discloses a stacker arrangement according to a first aspect of the invention;

Figure 4 schematically discloses a flow chart according to a first aspect of the invention;

20 Figure 5 schematically discloses a stacker arrangement according to a second aspect of the invention;

Figure 6 schematically discloses a flow chart according to a second aspect of the invention;

Figure 7 schematically discloses a stacker arrangement according to a third aspect of the invention; and

25 Figure 8 schematically discloses a flow chart according to a third aspect of the invention.

DETAILED DESCRIPTION

Figure 1 is a schematic and simplified view of a production line 1 for manufacturing absorbent products. The production line 1 comprises a converting machine 2 and a stacker unit arrangement 3. More specifically, the converting machine 2 of production line 1 is arranged for manufacturing absorbent products that start out as an essentially continuous first material web 4, which is fed forward in a known way from a first roll 5 or the like, in a direction that is indicated by arrows in Figure 1.

According to an example of the invention, the first material web 4 consists of a backing layer for a disposable diaper, that is a material of the type that is non-permeable to liquid or that has at least a high resistance to the penetration of liquid, but which, however, is breathable. For this purpose, the first material web 4 consists suitably of a thin and waterproof plastic film of, for example, polyethylene, polypropylene or polyester. Alternatively, a laminate of non-woven material and plastic film or other suitable and previously-known layers of material can be utilized as a liquid-tight backing layer.

The first material web 4 can be fed forward by means of two rollers 6, 7 which are arranged to give the first material web 4 that will become the backing layer, a certain given feed speed.

Figure 1 also shows a non-contact printing unit 8 arranged to print a motif on the backing layer. This motif is in the present example printed on the first material web 4 as a first production step. The non-contact printing unit 8 can however be set-up at any position along the length of the production line 1 in order to print a motif on any part of the absorbent article.

As shown in Figure 1, the first material web 4 can be divided into a certain nominal division length LN , which is a length that is defined between two transverse positions 9, 10 that delimit a particular product. According to the embodiment that is shown in Figure 1, the nominal division length LN consists in particular of a product length that corresponds to the front edge and back edge of a finished product. However, these lines are not printed on the first material web 4.

As shown in Figure 1 in a schematic and simplified way, the first material web 4 is fed through a processing equipment 11 where a number of work elements and process steps are carried

out in a way that is already known by a number of production units 12. These work elements can comprise, for example, the application of various types of absorbent material, wadding material and the like, and any other material and components such as, for example, elastic, adhesive tape and the like. The work elements that are carried out in the processing equipment 11 can also comprise folding, cutting, ultrasound welding and other processing steps. The manufacture of absorbent products by means of a series of such work elements is already known, and for this reason will not be described here in detail. As an example, however, reference can be made to patent document WO 00/59429, which describes an example of a previously-known manufacturing process for absorbent products.

Still with reference to Figure 1, it can be noted that the first material web 4 has passed a detecting device 13 just before it is fed into the processing equipment 11. The detecting device 13 is arranged to detect any production errors or quality deficiencies in the absorbent article. The first material web 4 is fed past a gluing station 14 at which adhesive is applied in order to enable a subsequent outer layer to be glued on, in the way that will be described below.

The detecting device 13 consists of a suitable device for optical inspection, according to one example in the form of a vision system that is arranged in association with the first material web 4. The detecting device 13 may also consist of a suitable device for inspection by other means, for instance infrared, x-ray or laser. Two or more means for inspection may also be combined in the same detecting device 13. Additional detecting devices 13 can be located at other locations along the length of the production line 1.

The detecting device 13 is connected to a computer-based control system 15. Information from the detecting device 13 is transmitted to the control system 15, which in turn is provided with software that is arranged to detect production errors or quality deficiencies. In addition, the control system 15 is connected to the production units 12 of processing equipment 11, the gluing station 14, the non-contact printer unit 8 and the rollers 6, 7. When an error is detected the absorbent article is tagged for removal and tracked throughout the production line 1. At the same time a replacement manufacturing order for the removed absorbent article is provided to the production line 1.

When the first material web 4 has been fed past the detecting device 13, it meets a second material web 16, according to one example in the form of an essentially liquid-permeable layer that is intended to form an outer layer of the finished product. For this reason, the second material web 16 consists suitably of a non-woven material with a soft and smooth surface, such as, for example, a spun bond material of polypropylene fibre. Other examples of materials that are suitable for constituting the outer layer are perforated plastic films, such as, for example, a perforated polyester film.

The second material web 16 is thus joined to the first material web 4 (together with any additional layers of material and other components that are added in association with the processing equipment 11 as described above) for example by means of the adhesive that was previously applied at the gluing station 14. In this way, a complete material web 17 is created, intended to define a number of manufactured products, which is fed forward in a direction that is indicated by an arrow in Figure 1 and taken up and fed forward by means of two additional driving units, for example in the form of two rotating feeding rollers 18, 19 arranged respectively over and under the complete material web 17. In this way, the complete material web 17 can be fed forward.

After the assembly with the second material web 16, a complete continuous material web 17 is thus created, consisting of a number of finished absorbent products that are still joined together. This material web 17 is finally fed past a cutting station 20, suitably of the “cross-cutter” type, where cutting is carried out at positions that essentially correspond to the transverse positions 9, 10 for each finished product. In this way, a number of finished products 21 are created in the form of absorbent products. The finished products 21 pass a rejection station 22 where products tagged for removal are removed. The finished products 21 are thereafter transferred to a stacker unit arrangement 3. Different aspects of stacker unit arrangements 3 are described in more detail below.

The above description is of course also applicable to other types of absorbent articles, such as sanitary napkins, panty liners, incontinence pads or similar.

Figure 2a schematically shows a flow chart showing a first example of providing a replacement manufacturing order. Box 201 illustrates continuous production of products A, B, and C in repeating series. In box 202 an error is detected in absorbent article B, for instance by the

detecting device 13. Article B is tagged for removal and upon reaching the rejection station 22 is removed from the series. This is illustrated by box 203. Upon removal of article B, a replacement manufacturing order is provided to the production line 1 which starts production of replacement absorbent article B'. This is illustrated by box 204.

- 5 Figure 2b schematically shows a flow chart showing a second example of providing a replacement manufacturing order. The method for providing a replacement manufacturing order in the second example is the same as in described in figure 2a with the difference that the steps 203 and 204 are reversed, i.e. the replacement manufacturing order is provided to the manufacturing line as soon as absorbent article B is tagged for removal. This leads to that
10 the replacement absorbent article B' reaches the stacker arrangement quicker and the incomplete series can be completed sooner than for the example in figure 2a.

Figure 3 schematically discloses a stacker unit arrangement 3 according to a first aspect of the invention. The stacker arrangement comprises a first stacker unit 23 and a second stacker unit 24 each comprising a plurality of cassettes for holding absorbent articles. The first and second
15 stacker units 23, 24 are arranged such that finished products 21 can be transferred from the cassettes of the first stacker unit 23 to the cassettes of the second stacker unit 24 and/or from the cassettes of the second stacker unit 24 to the cassettes of the first stacker unit 23. In figure 3 and subsequent figures, the stackers are located next to each other on the same vertical level. It is also possible for the stackers to be located on top of each other such that
20 the first and second transfer arms are arranged to transfer absorbent products between the first and second stacker vertically or on different vertical levels as long as it is possible to transfer absorbent products between the two stackers 23, 24.

The first stacker unit 23 is arranged to rotate in one direction only, in this example counter-clockwise. The second stacker unit 24 is preferably arranged to rotate in both directions, i.e.
25 both clockwise and counter-clockwise.

In order to conveniently illustrate repeating series of unique absorbent articles, the absorbent articles are labelled A, B and C respectively, where at least one of the absorbent articles A, B, C is different from at least one of the other absorbent articles A, B, C. The method and arrangement can be extended to any number of products in a repeating series, such as for
30 example A,B,B,B,B; A, A, B, B, C, C; or the like. The repeating series may be of any length

having at least two articles, any series have at least one type of article that is different in terms of design, capacity, shape, form, or the like, from at last one of the other articles of said series, and there may be any number of samples in the series of any specific type of article, as long as the package can be handled and carried. There may be any number unique articles in a series, and finished package may have one or more series of the absorbent articles.

In figure 3 a number of repeating series of absorbent articles A, B, C coming from the converting machine 2 can be seen approaching the rejection station 22. An absorbent article B being previously tagged for rejection is removed at the rejection station 22. A replacement absorbent article B' which has been ordered upon removal of the absorbent article B can be seen between two series of absorbent articles A, B, C. The replacement absorbent article B' is manufactured to be identical to the removed absorbent article B. In figure 3 and the following figures the replacement absorbent article B' will be seen in multiple locations to illustrate the flow of the replacement absorbent article B'. In the first stacker unit 23 a number of complete series A, B, C can be seen as well as incomplete series comprising only products A, B; A, C or B, C. Complete series A, B, C in the first stacker unit 23 are transported to a first pusher arm 25 which pushes the complete series to a first packaging machine 26 connected to the first stacker unit 23.

With reference to figure 3, figure 4 schematically discloses a flow chart according to a first aspect of the invention. Step 401 illustrates continuous production of products A, B, and C in repeating series. In step 402 an error is detected in absorbent article B, for instance by the detecting device 13. Article B is tagged for removal. In step 403, upon tagging article B for removal, a replacement manufacturing order is provided to the production line 1 which starts production of replacement absorbent article B'. Upon reaching the rejection station 22 article B is removed from the repeating series. This is illustrated by box 404. In step 405, at the interface between the converting machine 2 and the stacker unit arrangement 3 a check may be performed to see if a series is complete, incomplete or if replacement articles are provided. If the series is complete, the absorbent article remains on the first stacker unit 23 and is thereafter pushed to the first packaging machine 26 for packaging. This is illustrated by step 406. If the series is incomplete, i.e. one or more absorbent articles are missing in the series; the incomplete series is transferred to the second stacker unit 24 awaiting completion by a replacement absorbent article from the first stacker unit 23. This is illustrated by step 407. If

one or more replacement absorbent articles are registered, these absorbent articles are transferred to the first stacker unit 23 and subsequently transferred to the second stacker unit 24 for filling the empty positions in the incomplete series of the second stacker unit 24. This procedure is illustrated by step 408. Replacement absorbent articles are preferably
5 manufactured to be positioned between series of absorbent articles for the purpose of preventing that a replacement absorbent article leaves an empty position within an otherwise complete series of absorbent articles upon transfer to the second stacker unit, because an empty position in the first stacker unit may result in that packages are filled with an empty position.

10 The check to see if a series is complete, incomplete or if replacement articles are provided may include a surveillance device, such as a vision system, camera, scanner, IR detector or the like. However, a more intelligent solution is to use the product information that is already available within the converter machine and to perform this check using software within a microprocessor. As discussed more in details below, the converting machine 2 typically
15 comprises a product register that is continuously updated. The product register comprises information concerning each product that is currently within manufacturing phase of the converting machine 2. The product information may include current position of each absorbent product within the converting machine 2, the acceptance status of each absorbent article, possible defects in any absorbent article due to known complications, such as splice in
20 the web, the empty positions along the production line of the converting machine 2 corresponding to removed absorbent articles. The control system of the converting machine is thus fully aware of the status of the absorbent articles leaving the converting machine 2, including delivery of complete series, incomplete series, and replacement products. A computer-based communication interface between the converting machine 2 and the
25 following stacker units 23, 24 would thus eliminate any need for a physical check, and the stacker units 23, 24 would receive information from the converting machine about what kind of product is supplied into each cassette of the first and second stacker units 23, 24 and be able to perform a virtual check.

When an incomplete series is transported past a first transfer arm 27 of the first stacker unit
30 23, the first transfer arm 27 transfers the incomplete series to empty cassettes of the second stacker unit 24. The replacement absorbent article B' enters a cassette of the first stacker unit

23 and is transported by the first stacker unit 23 to a position adjacent the first transfer arm 27. At the same time the second stacker unit 24 rotates such that an empty cassette of the second stacker unit 24 corresponding to a position in an incomplete series wherein an absorbent article B has been removed is placed directly opposite the cassette of the first stacker unit 23 in which the replacement absorbent article B' is located. The replacement absorbent article B' is transferred to the empty cassette of the incomplete series in the second stacker unit 24 by the first transfer arm 27 in order to complete the series. The completed series is then transported by the second stacker unit 24 to a second pusher arm 28 which pushes the complete series to a second packaging machine 29 connected to the second stacker unit 24.

Figure 5 schematically discloses a stacker unit arrangement 3 according to a second aspect of the invention. The stacker unit arrangement 3 in this aspect comprises a transportation means 30 such as a chute or a conveyor which is arranged to transport replacement absorbent articles from the converting machine 2 directly into a cassette of the second stacker unit 24 corresponding to a position in the incomplete series which corresponds to the position of the removed absorbent article to form a complete series in the second stacker unit 24. The transportation means 30 are connected to the converting machine 2 such that finished absorbent articles, regardless of if they belong to a complete or an incomplete series, are placed in cassettes in the first stacker unit 23. When a replacement absorbent article approaches the stacker unit arrangement 3 a dividing means 31 moves from a first position in which finished absorbent articles are inserted into the first stacker unit 23 to a second position in which the replacement absorbent article is transported by the transportation means 30 to the second stacker unit 24. Once the replacement absorbent article has entered the transportation means 30 the dividing means 31 moves back to the first position. The dividing means 31 can be any means known in the art for separating products in a flow of absorbent articles.

With reference to figure 5, figure 6 schematically discloses a flow chart according to a second aspect of the invention. Step 601 illustrates continuous production of products A, B, and C in repeating series. In step 602 an error is detected in absorbent article B, for instance by the detecting device 13. Article B is tagged for removal. In step 603, upon tagging article B for removal, a replacement manufacturing order is provided to the production line 1 which starts

production of replacement absorbent article B'. In step 604, upon reaching the rejection station 22 article B is removed from the repeating series. In step 605, at the interface between the converting machine 2 and the stacker unit arrangement 3 a check may be performed to see if a series is complete, incomplete or if replacement articles are provided. If the series is complete, the absorbent article remains on the first stacker unit 23 and is thereafter pushed to the first packaging machine 26 for packaging. This is illustrated by step 606. If the series is incomplete, the incomplete series is transferred to the second stacker unit 24 awaiting completion by a replacement absorbent article. This is illustrated by step 607. If one or more replacement absorbent articles are registered, these absorbent articles are transferred directly from the production line 1 to the second stacker unit 24 by means of transportation means 30 for filling the empty positions in the incomplete series of the second stacker unit 24. This procedure is illustrated by step 608. Replacement absorbent articles are preferably manufactured to be positioned between series of absorbent articles for the purpose of preventing that a replacement absorbent article leaves an empty position within an otherwise complete series of absorbent articles upon transfer to the second stacker unit, because an empty position in the first stacker unit may result in that packages are filled with an empty position. Similar to the first aspect, incomplete series of absorbent articles are transferred from the first stacker unit 23 to the second stacker unit 24 as described in conjunction with figures 3 and 4. Complete series in the first stacker unit 23 are transported to a first pusher arm 25 which pushes the complete series to a first packaging machine 26 connected to the first stacker unit 23. The completed series in the second stacker unit 24 is transported by the second stacker unit 24 to a second pusher arm 28 which pushes the complete series to a second packaging machine 29 connected to the second stacker unit 24. The check to see if a series is complete, incomplete or if replacement articles are provided may also here be realised by means of a physical monitoring or by software based on the production information that is available from the converting machine 2.

Figure 7 schematically discloses a stacker unit arrangement 3 according to a third aspect of the invention. The stacker unit arrangement 3 in this aspect comprises a transportation means 30 such as a chute or a conveyor which is arranged to transport replacement absorbent articles from the converting machine 2 to the second stacker unit 24. In this aspect of the invention, incomplete series of absorbent articles remain on the first stacker unit 23. Upon starting

production of the repeating series of absorbent articles, the transportation means 30 transports at least one of each absorbent article A, B, C in a repeating series to the second stacker unit 24 to function as an absorbent article buffer.

With reference to figure 7, figure 8 schematically discloses a flow chart according to a third aspect of the invention. In step 801 at least one of each absorbent article A, B, C is supplied to the second stacker unit 24 to fill the absorbent article buffer. Step 802 illustrates continuous production of products A, B, and C in repeating series. In step 803 an error is detected in absorbent article B, for instance by the detecting device 13. Article B is tagged for removal. In step 804, upon tagging article B for removal, a replacement manufacturing order is provided to the production line 1 which starts production of replacement absorbent article B'. In step 805, upon reaching the rejection station 22 article B is removed from the repeating series. In step 806 an incomplete series in the first stacker unit 23 is completed by providing a replacement absorbent article from buffer. When an incomplete series in the first stacker unit 23 passes a second transfer arm 32 of the second stacker unit 24, a replacement absorbent article having the same characteristics as the removed absorbent article is transferred from the absorbent article buffer of the second stacker unit 24 to the first stacker unit 23 into a position in an incomplete series corresponding to the position of the removed absorbent article to form a complete series. In step 807 a replacement absorbent article is supplied to the absorbent article buffer directly from the production line 1 by means of transportation means 30 thus refilling the absorbent article buffer by supplying the second stacker unit 24 with the replacement absorbent article.

With reference again to the detecting device 13, it can be noted in particular that it is arranged to detect production errors or quality deficiencies in the absorbent article, i.e. the manufacturing status of the absorbent article. Information regarding production errors or quality deficiencies in the absorbent article is then used for determining if the absorbent product is to be removed or not. For this purpose, the control system 15 is arranged with a virtual data-based product register. The product register includes, for each absorbent article along the production line, information concerning actual position, manufacturing status, quality status, absorbent product characteristics, etc.

When a production error or quality deficiency in an absorbent article is found, the control system 15 tags the specific absorbent article for removal in the product register, thus setting a manufacturing status of rejection. Thereafter, when an absorbent article tagged for removal reaches the rejection station 22, the specific absorbent article is removed by the rejection station 22.

The product register can be in the form of a single product register used for tracking the manufacturing status of an absorbent article along the production line 1, possibly including a stacker unit. Alternatively, a plurality of product registers, each covering an individual region of the production line and interconnected by data communication means may be used for tracking the manufacturing status of an absorbent article along the production line 1. A product register may be one of: a shift register, a data stack, a ring counter, a look-up table or the like.

Reference signs mentioned in the claims should not be seen as limiting the extent of the matter protected by the claims, and their sole function is to make claims easier to understand.

As will be realised, the invention is capable of modification in various obvious respects, all without departing from the scope of the appended claims. Accordingly, the drawings and the description are to be regarded as illustrative in nature, and not restrictive.

CLAIMS

1. Method for providing packages comprising absorbent articles such as diapers, sanitary napkins, panty liners, incontinence pads or similar, the absorbent articles being made by a production line (1) being arranged to manufacture unique absorbent articles in a specific sequence, each package comprising one or more repeating series of absorbent articles, wherein each series comprises at least one unique absorbent article being different from at least one of the remaining absorbent articles in the series, **characterized in that** the method comprises:

- removing an absorbent article of a series of absorbent articles from the production line (1),

- providing a replacement manufacturing order to the production line (1) for manufacturing a replacement absorbent article having the same characteristics as the removed absorbent article for subsequent completion of the incomplete series associated with the removed absorbent article.

2. Method according to claim 1, wherein the production line (1) comprises a first and a second stacker unit (24) for sorting and enabling packaging of absorbent articles into packages comprising one or more repeating series of absorbent articles, wherein the method comprises:

- supplying finished absorbent articles to the first stacker unit (23), and;

- supplying the first or the second stacker unit (24) with the replacement absorbent article for subsequent completion of the incomplete series associated with the removed absorbent article.

3. Method according to claim 2, wherein the subsequent completion comprises:

- transferring the incomplete series from the first stacker unit (23) to the second stacker unit (24),

- supplying the first stacker unit (23) with the replacement absorbent article,

- transferring the replacement absorbent article from the first stacker unit (23) into a position in the incomplete series corresponding to the position of the removed absorbent

article to form a complete series in the second stacker unit (24).

4. Method according to claim 2, wherein the subsequent completion comprises:

- transferring the incomplete series from the first stacker unit (23) to the second stacker unit (24),
- supplying the replacement absorbent article directly from a conveyer belt of a converting machine (2) of the production line (1) to the second stacker unit (24) into a position in the incomplete series corresponding to the position of the removed absorbent article to form a complete series in the second stacker unit (24).

5. Method according to any of claims 3 – 4, wherein the method comprises:

- transporting the complete series from the second stacker unit (24) to a packaging unit connected to the second stacker unit (24).

6. Method according to claim 2, wherein the subsequent completion comprises:

- providing the second stacker unit (24) with an absorbent article buffer comprising at least one specimen of each unique absorbent article of the repeating series of absorbent articles;
- transferring an absorbent article having the same characteristics as the removed absorbent article from the absorbent article buffer of the second stacker unit (24) to the first stacker unit (23) into a position in an incomplete series corresponding to the position of the removed absorbent article to form a complete series; and
- refilling the absorbent article buffer by supplying the second stacker unit (24) with the replacement absorbent article.

7. Method according to claim 6, wherein the method comprises:

- transporting the complete series from the first stacker unit (23) to a packaging unit connected to the first stacker unit (23).

8. Method according to any of the preceding claims, wherein the characteristics of the removed absorbent article is any of: a printing pattern, an embossing pattern, a dimpling

pattern, a cutting shape, a dimension, a size, a capacity performance, and a structural design.

9. Method according to any of the preceding claims, wherein both the first and second
5 stacker unit (24) supply complete series to the same packaging unit.

10. Method according to any one of the preceding claims, wherein the method comprises:

- monitoring absorbent article manufacturing quality
- deciding to remove an absorbent article of a series of absorbent articles from the
10 production line (1) when an absorbent article does not fulfil predetermined manufacturing
 quality requirements.

11. Method according to any one of the preceding claims, wherein the method comprises:

- tracking a manufacturing status of each absorbent article within at least part of the
15 production line (1) using at least one register.

12. Method according to claim 11, wherein a single register is used for tracking the
 manufacturing status of an absorbent article along the production line (1), or a plurality of
 registers interconnected by data communication means are used for tracking the
20 manufacturing status of an absorbent article along the production line (1).

13. Method according to claims 10-12, wherein a register is one of: a shift register, a data
 stack, a ring counter and a look-up table.

25 14. Arrangement for providing packages comprising absorbent articles such as diapers,
 sanitary napkins, panty liners, incontinence pads or similar, the arrangement comprising a
 production line (1) being arranged to manufacture unique absorbent articles in a specific
 sequence; wherein each package comprises one or more repeating series of absorbent
 articles, wherein each series comprises at least one unique absorbent article being
30 different from at least one of the remaining absorbent article in the series, **characterized**
 in that the arrangement upon removal of an absorbent article of a series of absorbent
 articles, is arranged to provide a replacement manufacturing order to the production line
 (1) to manufacture a replacement absorbent article having the same characteristics as the

removed absorbent article for subsequent completion of the incomplete series associated with the removed absorbent article .

15. Arrangement according to claim 14, wherein the arrangement further comprises a first
5 stacker unit (23) and a second stacker unit (24) for sorting and enabling packaging of
absorbent articles into packages comprising one or more repeating series of absorbent
articles, the production line (1) is arranged to supply finished absorbent articles to the first
stacker unit (23), and to supply the first or the second stacker unit (24) with the
replacement absorbent article for subsequent completion of the incomplete series
10 associated with the removed absorbent article.

16. Arrangement according to claim 15, wherein the first stacker unit (23) is arranged to
transfer an incomplete series to the second stacker unit (24), the first stacker unit (23) is
arranged to be supplied with the replacement absorbent article, the first stacker unit (23)
15 is arranged to transfer the replacement absorbent article into a position in the incomplete
series in the second stacker unit (24) corresponding to the position of the removed
absorbent article to form a complete series.

17. Arrangement according to claim 15, wherein the first stacker unit (23) is arranged to
20 transfer an incomplete series to the second stacker unit (24), a conveyor belt of a
converting machine (2) of the production line (1) is arranged to directly supply the second
stacker unit (24) with the replacement absorbent article into a position in the incomplete
series in the second stacker unit (24) corresponding to the position of the removed
absorbent article to form a complete series.

18. Arrangement according to any one of claims 16-17, wherein the arrangement is arranged
25 to transport the complete series from the second stacker unit (24) to a packaging unit
connected to the second stacker unit (24).

19. Arrangement according to claim 15, wherein the second stacker unit (24) is provided with
30 an absorbent article buffer comprising at least one specimen of each unique absorbent
article of the repeating series, the second stacker unit (24) is arranged to transfer an
absorbent article having the same characteristics as the removed absorbent article from

the absorbent article buffer of the second stacker unit (24) to the first stacker unit (23) in an incomplete series corresponding to the position of the removed absorbent article to form a complete series, and where the absorbent article buffer is refilled by supplying the second stacker unit (24) with the replacement absorbent article.

5

20. Arrangement according to claim 21, wherein a complete series is arranged to be transported from the first stacker unit (23) to a packaging unit connected to the first stacker unit (23).

10

21. Arrangement according to any of the claims 14-20, wherein the characteristics of the removed absorbent article is any of: a printing pattern, an embossing pattern, a dimpling pattern, a cutting shape, a dimension, a size, a capacity performance, and a structural design.

15

22. Arrangement according to any of the claims 14-21, wherein both the first and second stacker unit (24) are arranged to supply complete series to the same packaging unit.

20

23. Arrangement according to any one of the claims 14-22, wherein the arrangement is arranged to monitor absorbent article manufacturing quality, and to decide to remove an absorbent article of a series of absorbent articles from the production line (1) when an absorbent article does not fulfil predetermined manufacturing quality requirements.

25

24. Arrangement according to any one of the claims 14-23, wherein the arrangement is arranged to track a manufacturing status of each absorbent article within at least part of the production line (1) using at least one register.

30

25. Arrangement according to claim 24, wherein a single register is used for tracking the manufacturing status of an absorbent article along the production line (1), or a plurality of registers interconnected by data communication means are used for tracking the manufacturing status of an absorbent article along the production line (1).

26. Arrangement according to according to claims 24-25, wherein a register is one of: a shift register, a data stack, a ring counter and a look-up table.

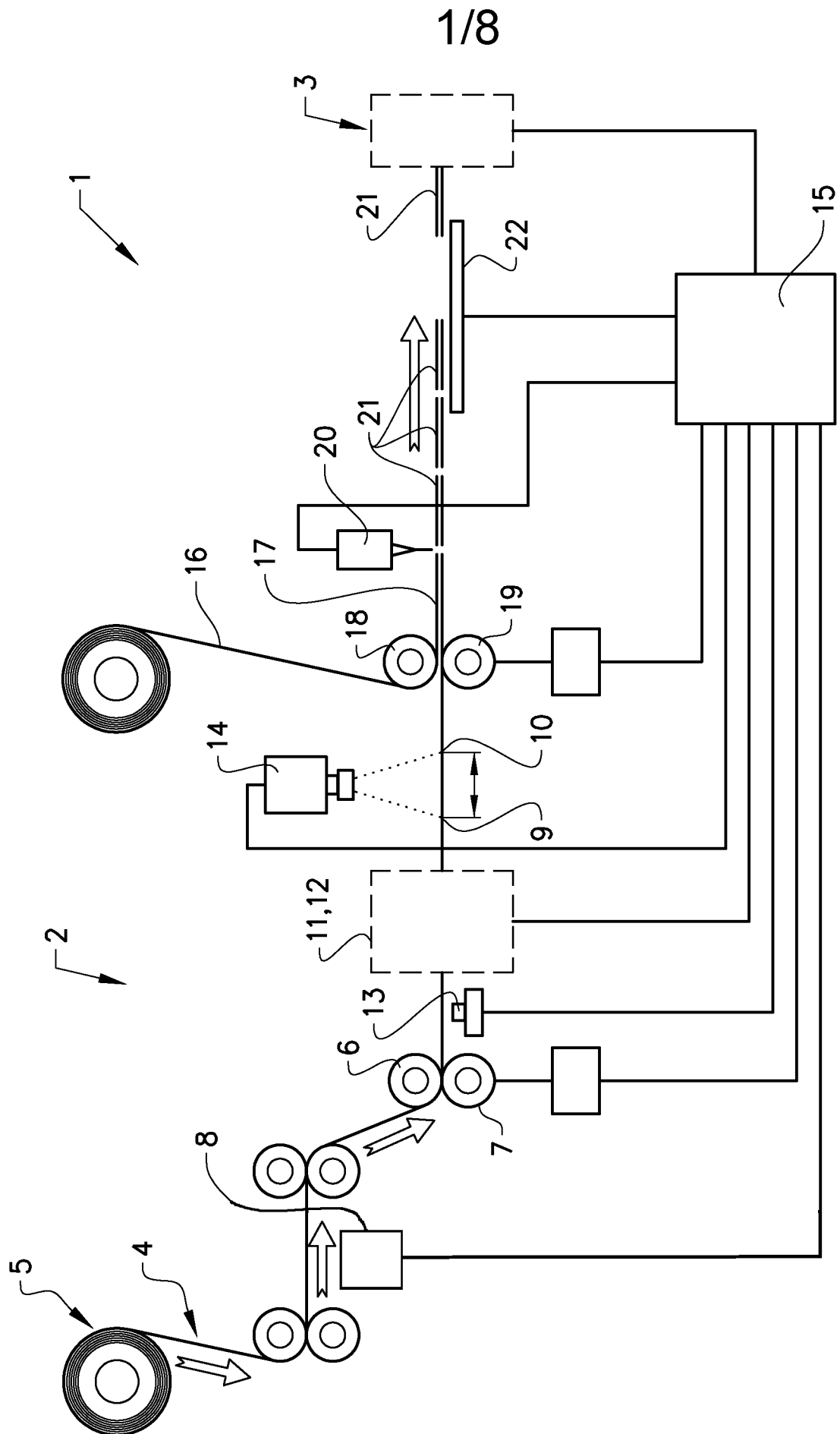


FIG. 1

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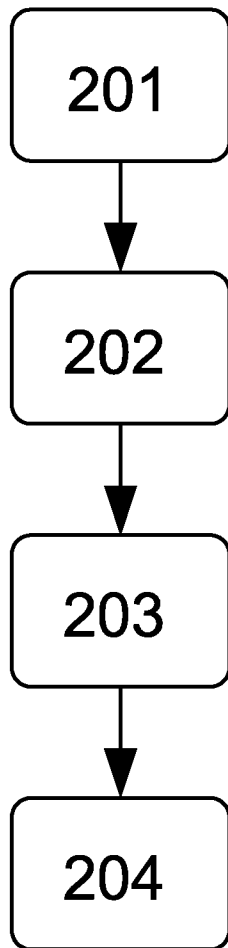


FIG. 2a

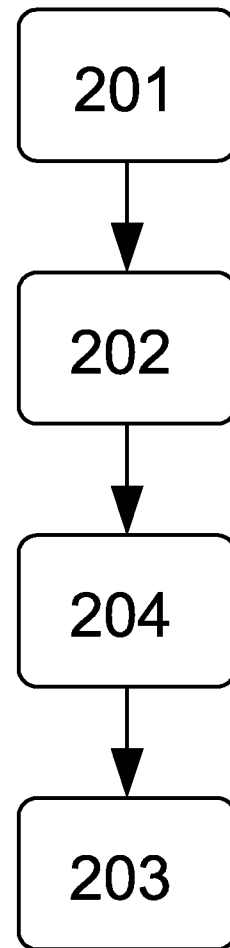


FIG. 2b

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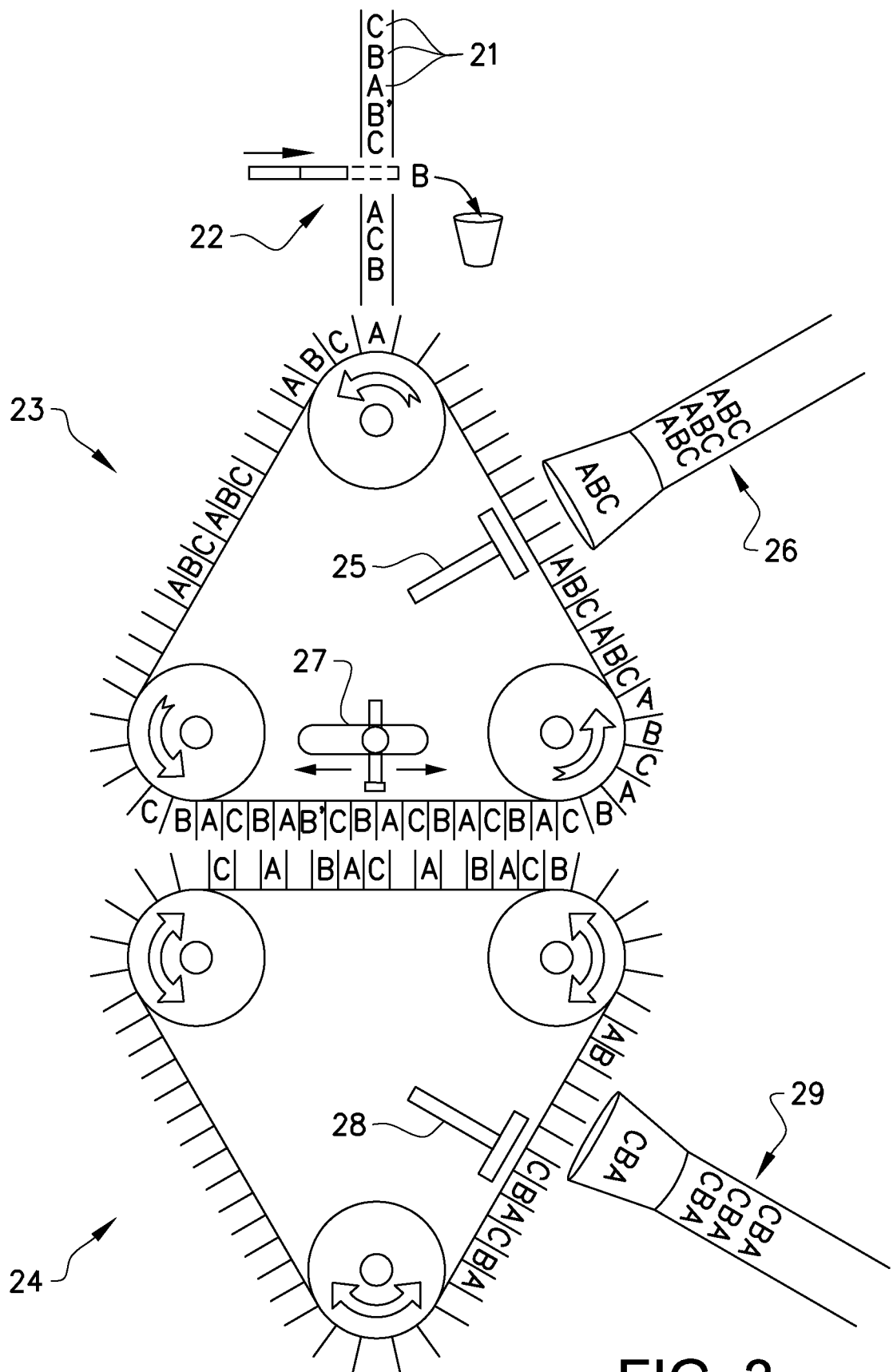


FIG. 3

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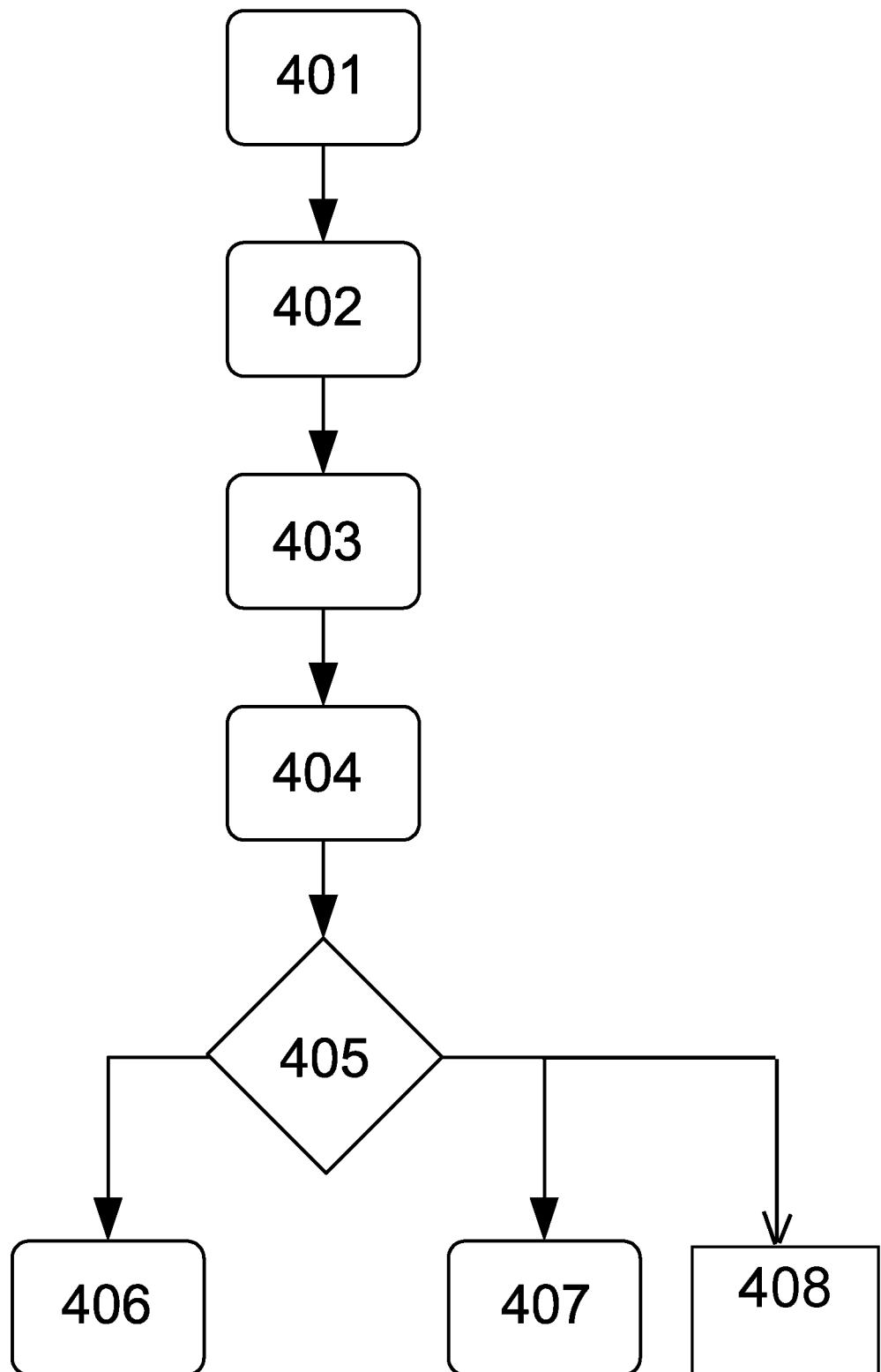
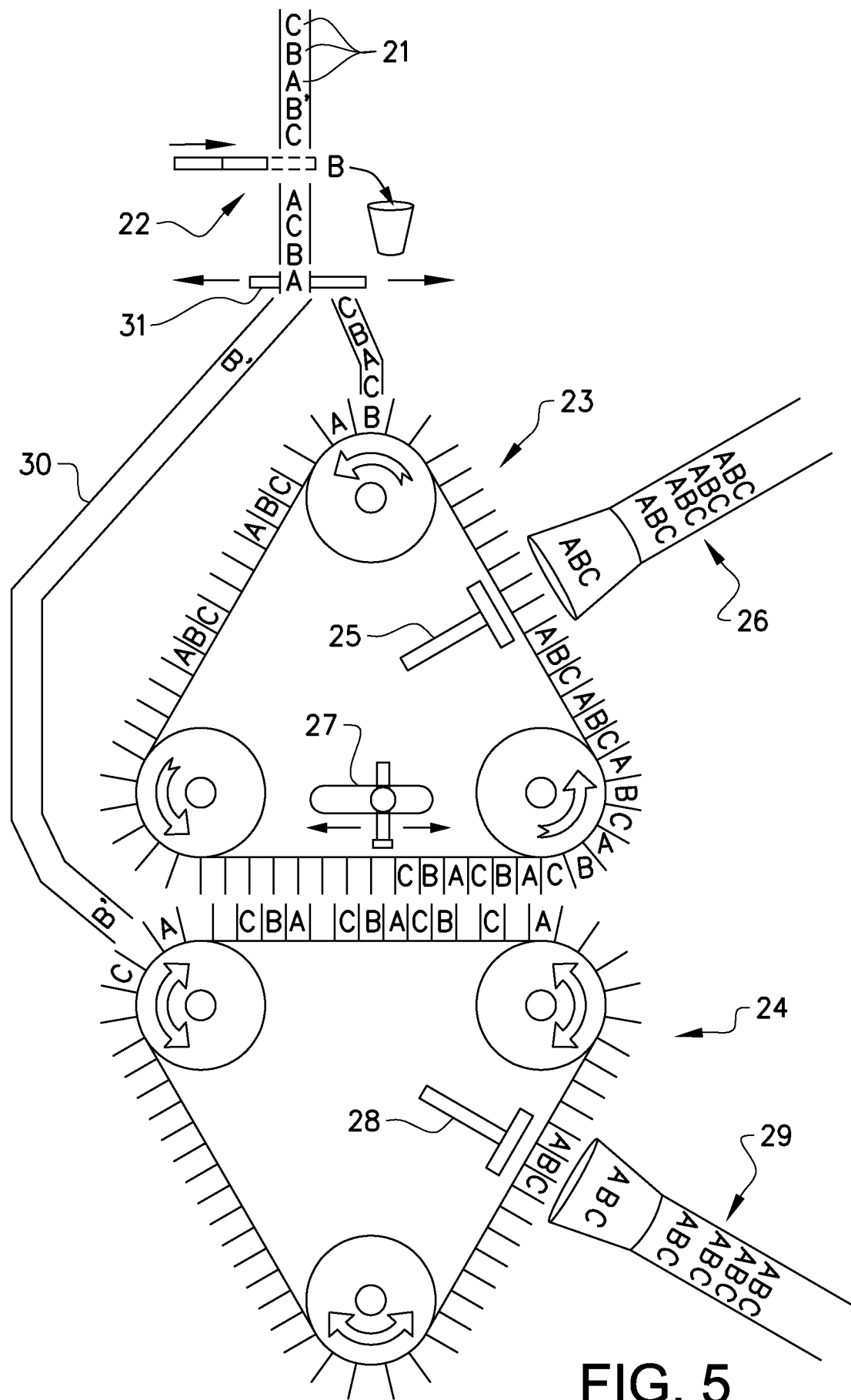


FIG. 4

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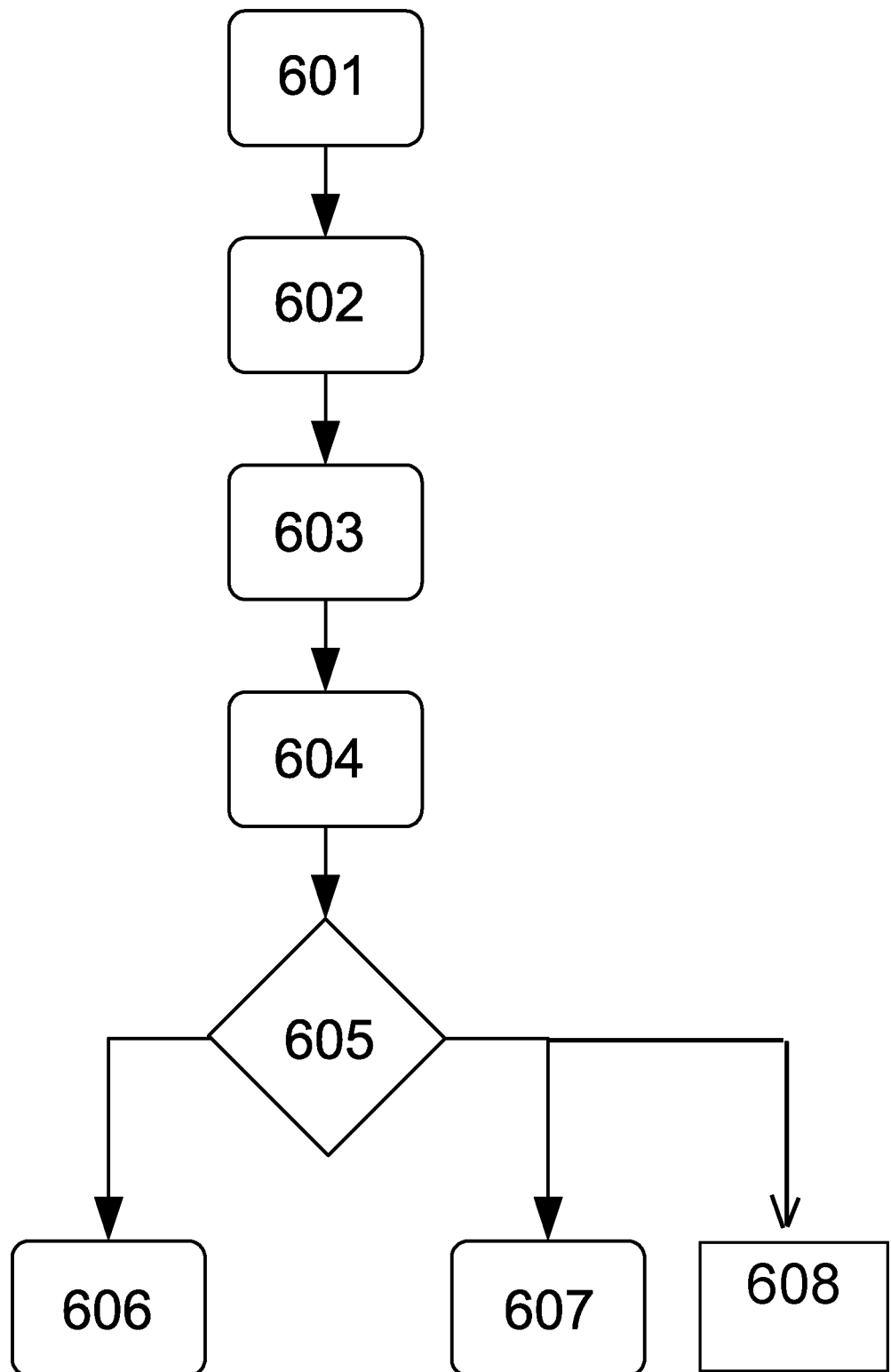


FIG. 6

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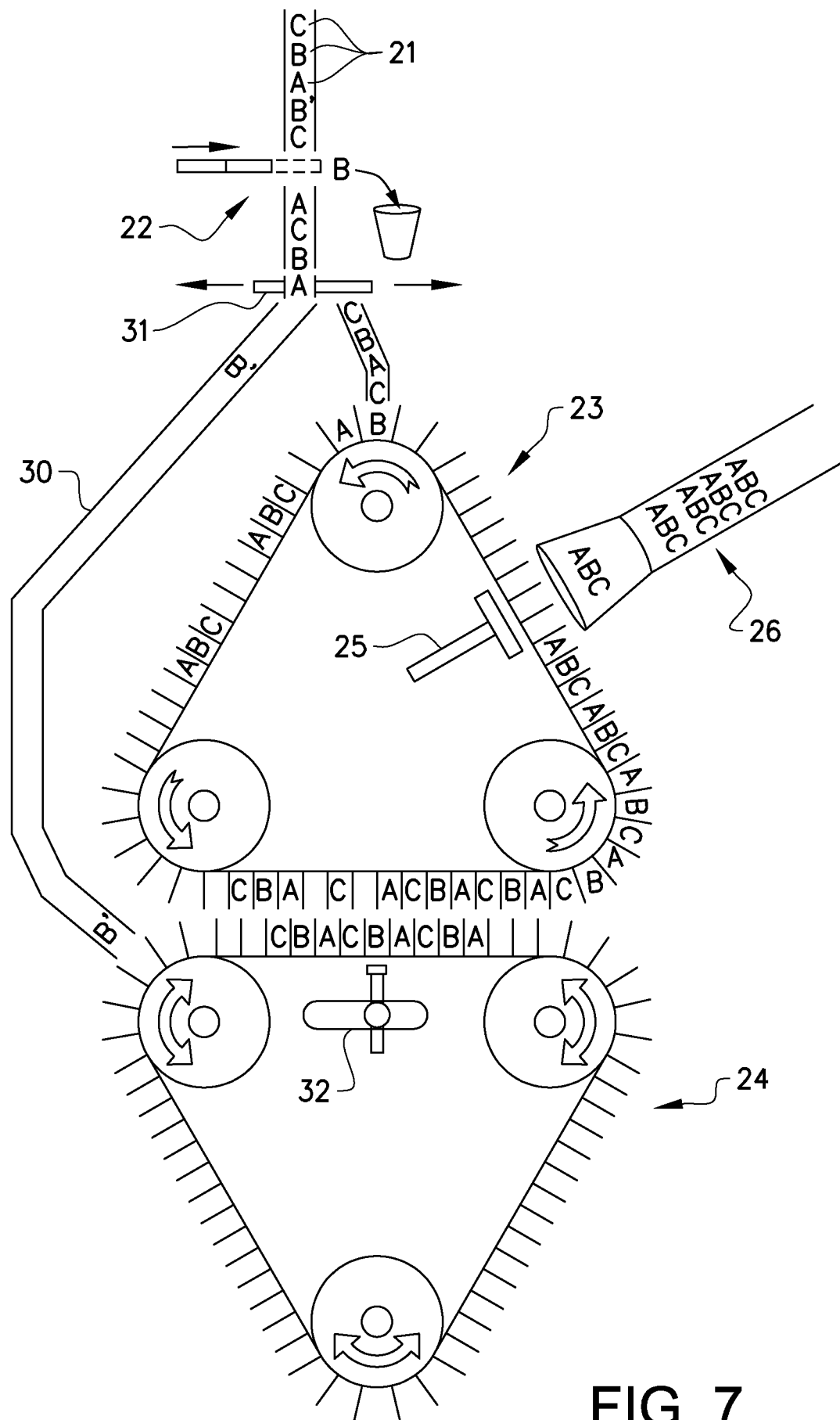


FIG. 7

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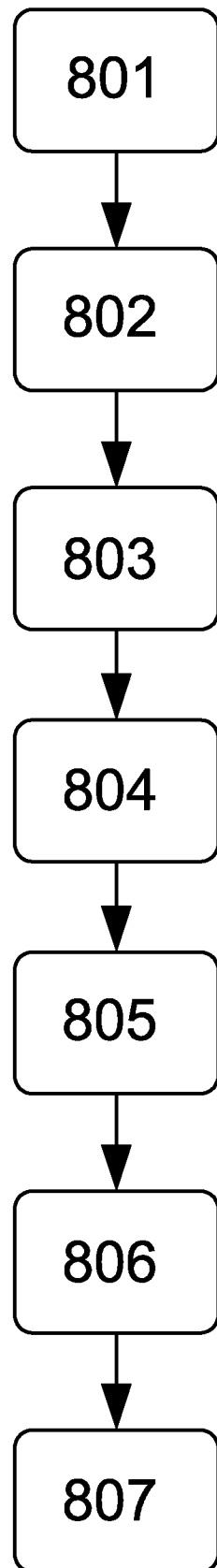


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2014/050528

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B65B, B65G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 20100138035 A1 (FECHT HEINO), 3 June 2010 (2010-06-03); abstract; figures; Paragraph [0012],[0013],[0041],[0069]-[0071] --	1-26
A	US 20110289886 A1 (MARTIN ZULEMA DORRONSORO ET AL), 1 December 2011 (2011-12-01); abstract; figures; Paragraph [0037],[0047] --	1, 14
A	WO 2013038310 A1 (FAMECCANICA DATA SPA ET AL), 21 March 2013 (2013-03-21); abstract; page 18, line 16 - page 19, line 2; figures --	1, 14



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

19-12-2014

Date of mailing of the international search report

19-12-2014

Name and mailing address of the ISA/SE

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE2014/050528

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 20100071318 A1 (BRANDHORST BJOERN ET AL), 25 March 2010 (2010-03-25); abstract; figures; Paragraph [0034] --	1, 14
A	US 6354984 B1 (HENSLEY ROBERT LEO ET AL), 12 March 2002 (2002-03-12); abstract; figures -- -----	1, 14

Continuation of: second sheet

International Patent Classification (IPC)

B65B 35/30 (2006.01)

B65B 35/44 (2006.01)

B65B 35/54 (2006.01)

B65G 47/08 (2006.01)

INTERNATIONAL SEARCH REPORT
Information on patent family members

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