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(54) **Title:** METHOD FOR ROLLING UP ARTICLES

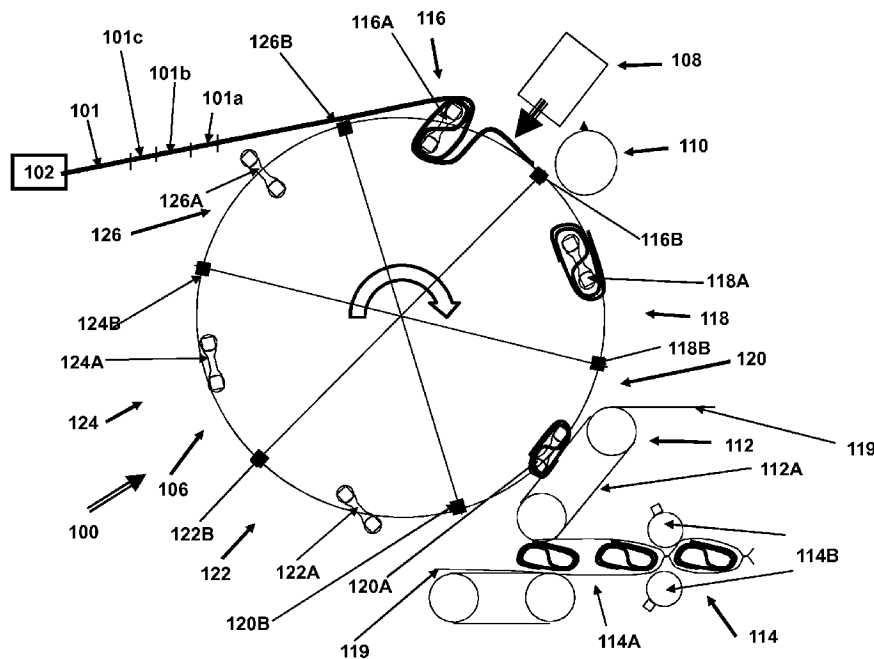


Fig. 1

(57) **Abstract:** The present invention is a method for rolling up continuous webs, being formed of segments, or articles, or precursor for such articles. The method includes the steps of attaching a mid-portion of such segments to a rotating spindle and rolling up the segments towards the front and rear portions of such segments.

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Method for rolling up articles

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Field of the invention

The present invention relates to the handling of webs which may be used in the manufacturing of articles, wherein portions of the webs are rolled up, and to an equipment for such manufacturing.

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Background

The patents US6258017B1 and US6385946B1 assigned to 'Ethicon' discuss methods for producing folded articles. The invention relates to the paper and fabric converting process for producing folded articles, wherein the rotary folder of the setup folds the incoming web elements one or more times along the axis of the rotary folder.

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The handling of web materials is described in various patent applications published in the name of the present applicant 'Concepts for Success - C4S', namely WO 06/103487, WO08/141756 A1 or WO08/037281 A1) assigned to 'Concepts for Success - C4S'. Whilst various process and equipment features described therein can be suitably combined with the present invention, they are not describing the rolling up of articles.

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Summary

In a first aspect, the present invention is a method for rolling webs comprising the steps of:

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- (a) providing a continuous web comprising a continuous series of segments, each of the segments comprises a front, a rear and a mid portion along the machine direction;
- (b) delivering the web to a roll-up device, the roll-up device comprises a plurality of roll-up stations, wherein each of the roll-up stations comprises a spindle having a rotational axis parallel to a cross direction of the web and being rotatable around the axis at a predetermined varying speed;
- (c) attaching a part of the mid portion of the web segments to the spindle;
- (d) rotating the spindle around the rotational axis when the part of the mid portion of the web segment being attached to the spindle, the segment being rolled up around the spindle from the mid portion towards the front and rear portions simultaneously to form a rolled-up web around the spindle;

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(e) withdrawing the spindle from the rolled-up web by a laterally outward movement along or parallel to the rotational axis of the spindle while the rolled-up web is being held by a web support.

Optionally, the spindle can move transitorily parallel to the machine direction whilst
5 rotating.

The attachment of the web to the spindle can be performed by one or more methods selected from the group of

- a. mechanically engaging a fork-type spindle; and
- b. vacuum supported attachment; and
- 10 c. engaging retractable needle- or hook-type elements to the web.

The method may further comprise one or more of the following steps:

- (m) separating segments of the web to form an article;
- (n) combining a first portion of the segments with another portion of the segments;
- (o) discharging the rolled-up web from the roll-up device by moving the spindle laterally
15 while the rolled-up web being affixed to the spindle at least at the start of said lateral movement; and
- (p) seaming the rolled-up web; and
- (q) packing the rolled up web.

The present invention also relates to articles manufactured according to the method as
20 described, which may be disposable or non-disposable garments including diapers, training pants etc. The articles may be individually packed or wrapped in an essentially endless web of packing or wrapping material

Brief Description of the Drawings

25 The embodiments herein will be better understood from the following detailed description with reference to the drawing, in which:

FIG. 1 illustrates a view of an apparatus for rolling webs, according to an embodiment herein.

Detailed Description

30 The embodiments, various features and advantages related to the present invention are explained in more detail in the accompanying drawing and the following description. The illustration used herein is intended to enable those skilled in the art to understand the ways in which the embodiments herein may be practiced. Accordingly, the illustration should not be construed as limiting the scope of the embodiments herein.

The embodiments herein provide a new and improved method for rolling webs by employing a roll-up device such as a rotary drum or a turret. The rotary drum or turret includes a minimum of two roll-up stations; each roll-up station includes a spindle. The incoming web material is rolled-up by the spindle when the spindle rotates around its own rotational axis so as to form the rolled-up web. The spindle can move translatorily in a direction perpendicular to the direction of movement of the web, and optionally along the direction of movement of the web. The rolling-up may be applied in the context of preparing individual articles, which may further be individually wrapped by a subsequent wrapping step.

It may also be applied in the manufacturing of web segments or articles, or precursors of such articles which have varying length on fixed length equipment. This equipment may combine or attach parts of the segments or articles to other parts, such as when forming a pants-style article. When worn by a wearer, such articles have a longitudinal extension terminated by a front and a rear waist line, and a cross directional extension terminated by left and right side margins.

When the article is supplied to the roll-up device with its front-to-back orientation of the article corresponding to the machine direction of the device, it may be folded along a cross-directional line such that the front and rear portions overlay and the sides may be combined such as by gluing or other bonding. Alternatively, and often more preferably, the article or its precursor is supplied to the roll-up device with its left to right orientation corresponding to the machine direction of the device, and may be folded along a fold line which extends parallel to the direction of web movement, such that the front and rear waist regions of the article are placed on top of each other.

It will be apparent to those skilled in the art and will also be further detailed herein below, that the roll-up device can be applied to many different uses. Thus, the reference to certain aspects such as shown in the accompanying drawing should not be considered limiting in any way. The figure is a schematic representation of the technical elements in a view of the manufacturing apparatus.

FIG. 1 illustrates a view of an exemplary apparatus 100 suitable for explaining rolling-up of webs according to the present invention.. The apparatus 100 includes a web supply means 102, a continuous web 101, and a roll-up device 106, optionally a combining means 108, optionally a first element of a separating means 110, a discharging means 112, and a final optional packing unit 114. The roll-up device 106 includes roll-up stations, here shown exemplarily with six thereof 116, 118, 120, 122, 124 and 126. The roll-up stations 116, 118, 120, 122, 124 and 126 includes spindles 116A, 118A, 120A,

122A, 124A and 126A. Optionally, each of the roll-up stations may comprise a second element of a separating means 116B, 118B, 120B, 122B, 124B and 126B, which may cooperate with the first element 110. The discharging means 112 may include a web support such as a vacuum belt 112A. The final optional packing unit 114 includes an optional wrapping means 114A and an optional package welding means 114B.

The apparatus 100 may be used for manufacturing of rolled-up web articles. The web articles may be a disposable or a non-disposable article. For example, the article may be an absorbent article, a diaper, training pants and other similar articles.

The web supply means 102 may be used to deliver the continuous web 101 towards the roll-up device 106 at a supply web speed in machine direction.

The continuous web includes a series of segments. The web segments include a front (101a), a rear (101c) and a mid (101b) portion along the machine direction, i.e. the direction of movement of the web 101. It should be noted, that this orientation does not necessarily need to correspond to the orientation of portions or segments during use, i.e. the longitudinal extension of an article may be such that it corresponds to the machine direction of the web or to the cross-machine direction thereof. The mid portions of the web segments do not necessarily need to be symmetrically centred between the front and the rear portion along a manufacturing direction. In one embodiment, the web may be at least one of a single or a composite material of any shape. The web segments may be non-uniform across a width and length with regard to at least one of a thickness, a composition, number of composite layers, densities, basis weights, etc. The web segments may be folded along longitudinal fold lines such as their longitudinal centreline.

The roll-up device 106 may be configured as a parallel treatment unit, preferably as a rotatable drum or a turret located between the web supply means 102 and the discharging means 112. In one embodiment, the roll-up device 106 includes at least two roll-up stations moveably connected to a roll-up construction frame (not shown in the figure). The spindles 116A, 118A, 120A, 122A, 124A and 126A of the roll-up stations 116, 118, 120, 122, 124 and 126 include a rotational axis parallel to the cross- direction of the web. The spindles 116A, 118A, 120A, 122A, 124A and 126A also include an attachment means (not shown in the figure). In one embodiment the attachment means is in the form of a fork with a plurality of prongs. The prongs may be used to receive the web segments. The attachment means may additionally to such a fork or alternatively include a controllable vacuum suction with openings to affix the received web segment and/or needle or hook type elements, optionally retractable.

In one embodiment, the spindles 116A, 118A, 120A, 122A, 124A and 126A are translatorily moveable along or parallel to the rotation axis so as to allow the attachment means to engage and/or disengage with the web. The spindles 116A, 118A, 120A, 122A, 124A and 126A may also be translatorily moveable parallel to the machine direction.

5 When executing the present process and considering the beginning of an rolling-up cycle, the spindle may be positioned close to an upstream (i.e. positioned towards the supply means) separation means (e.g. 126B), which interacts further downstream (i.e. positioned towards the discharge means) with separation means 110, when it makes contact to the web and picks and holds part of the web. In the case of the spindle as a
10 pronged fork, the web is positioned between these prongs and upon rotation of the roll-up device 106 a part of the mid portion of the web segment is attached to the spindle 116A in the roll-up station 116. When a portion of the web segment is attached to the spindle 116A, the spindle 116A is further rotated around the rotational axis to roll-up the web segment—around the spindle 116A from a mid portion towards the front and rear
15 portions simultaneously. The spindle 116A is optionally moved translatorily parallel to the machine direction towards a downstream web separating element 116B, which interacts later downstream with the stationary first element of a web separating means 110. The translatory motion of the spindle may advantageously be applied when forming pants-style articles, in particular when articles of varying lengths are to be manufactured
20 without exchanging size parts.

 The respective parts of the segments or articles may be combined respectively by the combining means 108. The combining means 108 may combine one or more parts (e.g., by gluing) of the respective web segments. In one embodiment, the combining means 108 may be used to temporarily or permanently affix parts of an article or its
25 precursor to each other.

 The combined precursor may be separated into individual articles by the first element of the web separating means 110 interacting with the second elements separating means 116B, 118B, 120B, 122B, 124B and 126B of the rollup stations. The web separating means may be a cutting system with anvil and knife elements, whereby one of these
30 elements is affixed to the roll-up construction frame (110), and the other elements 116B, 118B, 120B, 122B, 124B and 126B affixed relative to the roll-up device 106. The web separating means is used for separating segments from said web into pieces respectively articles. In one embodiment, the web separating means 110 may separate a leading segment from a trailing segment (along machine direction) such that parts of or all of the

leading segment is rolled up around the spindle, parts of or all of the trailing segment is rolled up while still being connected to a further leading segment.

The rotational predetermined variable speed of the spindle is preferably adapted such that the trailing segment is kept under essentially constant tension such that the rotational and translatory movement of the spindle are matched to the infeed speed of the web so as to not tear off the leading segment from the trailing segment prior to the optional separation step. In one embodiment, the rotational speed of e.g. the spindle 116A when receiving the web is $v(1) = 0$, $v(2) > 0$ from receiving the web then until prior to the combining or separation steps, $v(3) = 0$ while combining or separating. The speed of the spindle 118A may be $0 < v(4) < v(2)$ after combining or separation (as shown in the roll-up section 118). In case of unrolling again (e.g., no separation step), the speed of the spindle becomes $v(5) < 0$ (as shown for the spindle 120A in the roll-up section 120). Herein, a rotational speed is considered relative to the roll-up stations, and positive, if it rotates in the same direction as the turret, i.e. in Fig. 1 clock-wise.

In the preceding roll-up station, in the example 118, the web article may be further rolled-up around the spindle 118A. In the roll-up station 120, the spindle 120A is withdrawn from the web article by a laterally outward movement along or parallel to the rotational axis while the article is being held e.g. by the vacuum belt 112A of the discharging means 112, the belt moving essentially with the speed of the belt contacting surface of the article rolled up in rollup station 120 of rollup device 106.

The rolled-up articles may then be discharged from the roll-up device 106. The discharging means 112 may release the separated and rolled up web articles from the roll-up device 106. The optional packing or wrapping means 114A and an optional package welding means 114B may include an enveloping means for wrapping the rolled-up articles such as between wrapping films 119.

In one embodiment, the rolled-up articles are individually packed or wrapped optionally by forming an essentially endless series of individually packed or wrapped articles in pieces or segments of an essentially endless web of packing or wrapping material.

Alternatively, the web may remain unseparated, and may be unrolled such as after a treatment such as a combining step has been performed.

The present invention may be applied to a wide variety of articles. Without wishing to imply any limitation, it may be used for making disposable or non-disposable articles such as absorbent articles, diapers, training pants etc and similar articles.

Working the details of the embodiments is within the routine of an ordinary person skilled in the art of manufacturing of rolled-up articles and is not considered limiting in any way for the present invention.

Claims

What is claimed is:

1. A method for rolling webs comprising the steps of:
 - 5 (a) providing a continuous web comprising a continuous series of segments, each of said segments comprise a front, a rear and a mid portion along the machine direction;
 - (b) delivering said web to a roll-up device, said roll-up device comprises a plurality of roll-up stations, wherein each of said roll-up stations comprises a spindle having a rotational axis parallel to a cross direction of said web and being rotatable around
10 said axis at a predetermined varying speed;
 - (c) attaching a part of said mid portion of said web segments to said spindle;
 - (d) rotating said spindle around said rotational axis when said part of said mid portion of said web segment being attached to said spindle, said segment being rolled up around said spindle from said mid portion towards said front and rear portions
15 simultaneously to form a rolled-up web around said spindle;
 - (e) withdrawing said spindle from said rolled-up web by a laterally outward movement along or parallel to the rotational axis of said spindle while said rolled-up web is being held by a web support.
- 20 2. The method of claim 1, whereby said spindle moves translatorily parallel to the machine direction whilst rotating.
3. The method of claim 1 or 2, wherein said method further comprises one or more of the following steps:
 - 25 (m) separating segments of said web to form an article;
 - (n) combining a first portion of said segments with another portion of said segments;
 - (o) discharging said rolled-up web from said roll-up device by moving said spindle laterally when said rolled-up web being affixed to said spindle; and
 - (p) seaming said rolled-up web; and
 - 30 (q) packing said rolled up web.
4. A method according to any of the preceding claims, wherein said attachment of said web to said spindle is performed by one or more steps selected from the group of
 - (r) mechanically engaging a fork-type spindle; and
 - 35 (s) vacuum supported attachment; and

- (t) engaging hook-type elements to the web; and
- (u) engaging retractable needle or hook-type elements to the web.

- 5 5. An article manufactured according to a method comprising the method according to claim 1.
- 6. An article according to claim 5 being a pant-like article, and/or a disposable absorbent article.
- 10 7. A series of articles according to claim 5 or 6, wherein each article is individually packed or wrapped in segments of an essentially endless web of packing or wrapping material.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/050240

A. CLASSIFICATION OF SUBJECT MATTER
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ADD.
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)
B65H A61F

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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	column 11, line 4 - line 18; figures 3,4,5,7	1
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A	page 16, line 25 - page 17, line 2 page 31, line 33 - page 32, line 2; figure 17	1-4
X	----- US 2009/196635 A1 (MORITA RYO [JP]) 6 August 2009 (2009-08-06)	5-7
A	paragraph [0025] - paragraph [0028]; figures 4,6	1-4
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Further documents are listed in the continuation of Box C.

See patent family annex.

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/050240

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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A	DE 39 11 250 C1 (LEMO M. LEHMACHER & SOHN GMBH) 17 May 1990 (1990-05-17) column 2, line 66 - column 4, line 23; figures -----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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