(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
07 March 2019 (07.03.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/042513 A1

(51) International Patent Classification:
B65B 9/14 (2006.01) *B65B 41/12* (2006.01)
B65B 39/02 (2006.01) *B65B 43/34* (2006.01)

(21) International Application Number:
PCT/DK2018/050213

(22) International Filing Date:
29 August 2018 (29.08.2018)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PA 2017 70655 30 August 2017 (30.08.2017) DK

(71) Applicant: **FRANK BRUHN APS** [DK/DK]; Smoel 1, 6310 Broager (DK).

(72) Inventor: **BRUHN, Frank**; Smoel 1, 6310 Broager (DK).

(74) Agent: **ORSNES PATENT**; Forskerparken 10, 5230 Odense M (DK).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

(54) **Title:** PACKAGING SYSTEM AND METHOD FOR PACKAGING OBJECTS

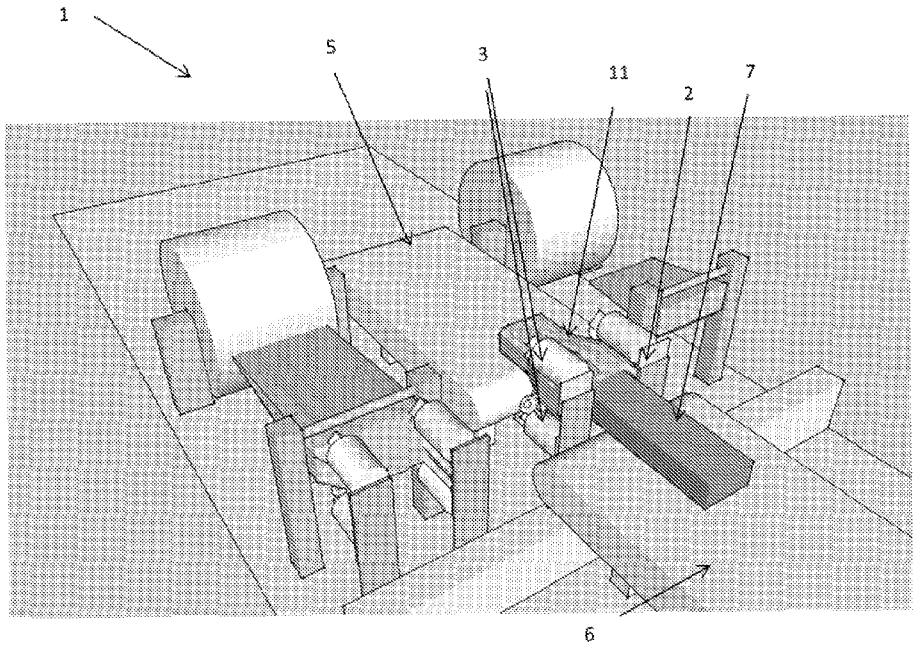

Figure 3

(57) **Abstract:** There is provided a system (1) for packaging objects (7) on a conveyor (5, 6) using a tubular plastic film (11). More specifically, the invention provides a system (1), wherein the tubular plastic film (11) can be wrapped around the objects (7) in a horizontal manner.

WO 2019/042513 A1

PACKAGING SYSTEM AND METHOD FOR PACKAGING OBJECTS

FIELD OF THE INVENTION

The invention relates to a system and method for continuously packaging multiple objects on a conveyor using a tubular plastic film. More specifically, the invention provides a system, wherein the tubular plastic film can be wrapped around long objects.

BACKGROUND OF THE INVENTION

It is already known to package objects, including compressible objects, by completely or partially manual operations, wherein the objects are introduced into a pre-manufactured, bag-shaped plastics film, i.e. a bag, prior to packaging. In some cases the bag-shaped plastics films can be advanced automatically to the operator from a stack; and likewise the objects may be advanced to the site of packaging by means of belt conveyors etc. Manual operations are cost-intensive and likewise the capacity-even that of automatic auxiliary equipment-is limited. The latter means that the execution of the operations becomes very space-intensive. The manual handling of the bags can be replaced by an automated handling only with difficulty since it is difficult to detect corners, rims and edges accurately to enable accurate seizure of the bags. Unless the bags are seized accurately there is a risk of them being damaged during the handling procedure.

Stretch packaging aims to give protection to a stack of goods during transport against humidity and other environmental influences. The wrapping with a foil hood ensures stability to the packed goods.

Prior art systems are generally used for the purposes of wrapping up a product, which is arranged for the most part on a pallet, at least in part with a tubular film in a packaging machine. This serves to stabilize the product and to provide protection

against the surroundings. The tubular film may be configured as a hood that is closed at the top or as a band that is open at the top and the bottom.

Prior art systems utilize a tubular film portion matching the size of the product and the systems basically unroll a portion of the film onto gathering fingers which are fastened to a frame. A gathering drive unit is then moved into contact with the tubular film portion such that an operative connection is created. By driving the gathering roller, the tubular film portion is gathered-up onto the individual gathering fingers such that a film store laid in folds is formed on the respective gathering finger. Once the tubular film portion has been gathered-up, the gathering fingers are driven in a substantially horizontal manner such that the tubular film portion is expanded or stretched. Expanding or stretching refers to a state where an elastic or elastic-plastic deforming of the tubular film occurs. The gathering fingers are then driven in a vertical manner along the product. At the same time the tubular film is released from the gathering fingers and the product is wrapped up therein as a result of the elastic resiliency of the tubular film portion.

Such systems are used for example in hood packaging installations. These may be installations which operate on the basis of what is known as the hood stretching process or the hood shrinking process. Both processes are distinguished by the fact that a portion of a tubular film is pulled or pushed over any desired cargo, or that the cargo is introduced into the portion of tubular film by means of a lifting table. This is referred to hereafter as wrapping of cargo.

In the case of most hood packaging installations, the portion of tubular film is first reefed by means of a reefing device, to then be slipped over the cargo by the reefing device or by a separate drawing-over device and thereby unreefed. During the reefing, a supply of portions of tubular film laid in folds, which is also referred to hereafter as a film store, is formed at the bottom of the reefing fingers. If the reefing device is also used for the drawing over, the reefing device is moved in relation to the cargo, possibly after stretching the portion of tubular film. During this relative movement, the portion of tubular film is pulled off from the reefing fingers, is also referred to as unreefed.

US5024042 discloses a system for packaging objects in hose-shaped foil which comprises a movable packaging frame having a plurality of horizontally arranged

gripping arms for holding and stretching the foil, a conveyor for supporting objects and transporting it towards the packaging frame, so that the object is delivered between the gripping arms. US502402 does not disclose gripping arms equipped with opposing and activated rollers and that a second conveyor is positioned next to the packaging frame, where the second conveyor transports the packaged object away from the packaging frame.

EP0652156 discloses a machine for packaging a number of food casing strands in film, which is tubular and made of plastics. The packaging method comprises that the film is transferred to transport means while forming a number of wrinkle shaped folds. The film positioned on the transport means is then cut off from the remaining part of the film, following which the open ended tubular film is stretched and arranged to receive the food casing strands. The objects are then transferred into the stretched tubular plastic film in such a manner that the film is gradually pulled off because the diameter of the group of food casing strands is larger than the diameter of the open end in the tubular film. Finally the opposite end of the tubular film package with the food casings strands is closed.

US3798872 discloses an apparatus for manually stuffing foodstuff into tubular netting. The apparatus comprises an immobile stuffing tubular element, a slideable blade onto which the food stuff is placed. The netting is gathered exterior to the tubular element by a net gathering carry and the foodstuff is thereafter slid into the stuffing tubular element. The foodstuff is thereafter pushed out of the tubular element by a pneumatic system comprising a piston, and the gathered netting would be pulled over the food stuff. Thereafter the netting can be cut by cutting means and the food would be stuffed into the netting.

WO2016070883 discloses a system for packaging objects on a conveyor using a hose-shapedstretch foil. More specifically, WO2016070883 discloses a system, wherein the hoseshaped stretch foil can be wrapped around objects in a horizontal manner.

There is a need to improve the existing systems by reducing the size thereof and by decreasing the packaging time and complexity. In particular there is a need to improve the efficiency of packaging objects in hose-shaped enclosures.

SUMMARY OF THE INVENTION

The system according the present invention differs from the systems described above in that wrapping is achieved horizontally instead of vertically. Several technical features are essential to achieve horizontal wrapping and the system is characterized by a higher production cycle and hence a higher efficiency.

Thus, in a first aspect the present invention concerns a system for packaging objects with a tubular plastic film, said system comprises:

- a movable gripping unit having a plurality of horizontally oriented gripping arms for holding and releasing the tubular plastic film onto an object;
- a first conveyor for supporting the object and transporting it toward the gripping unit in an axis parallel with the gripping arms so that the object is delivered between the gripping arms;
- a second conveyor for supporting the object and transporting it away from the gripping unit, said second conveyor placed next to the gripping unit, which during packaging is placed between the first and second conveyors;
- elements adapted for cooperating with each other for temporarily holding the film, said elements enclosing a cutting device and a welding device; and
- a control unit.

The inventors have surprisingly found that when applying the elements adapted for cooperating with each other for holding the film encloses the welding and cutting device then several objects may be packaged in a row.

The elements adapted for cooperating with each other for holding the film preferably comprise a set of reciprocating elements that can be forced together in order to press against the outer surface of the film, while the cutting device and welding device, which is placed between the set of reciprocating elements, cuts and welds the film thereby generating two closed ends.

In a particularly preferred embodiment of the present invention the control unit is programmed to execute the following steps:

- loading the movable gripping unit with tubular plastic film;
- directing the movable gripping unit to be placed between the first and second conveyors, whereby the gripping arms are positioned axially with the conveyors;
- activating the first conveyor to transport the object toward the movable gripping unit, wherein the object moves along and in between the gripping arms;
- activating the gripping unit to release film from the gripping arms onto the object while the object moves towards the second conveyor;
- set of reciprocating elements that can be forced together in order to press against the outer surface of the film, while the cutting device and welding device, which is placed between the set of reciprocating elements, cuts and welds the film thereby generating two closed ends; and
- moving the object with closed ends to the second conveyor to transport the packaged object away from the gripping unit.

In order to reduce the time for loading tubular film onto the gripping arms the movable gripping unit is preferably loaded with tubular plastic film for packaging at least 3 objects, more preferably for packaging at least 5 objects, and most preferably for packaging at least 10 objects.

In one embodiment the system is configured to accommodate a long object by consecutively releasing tubular film segments along the object, said segments overlapping each other along the length of the object.

.

The present invention also provides a method for packaging objects tubular film with the system of the present invention, said method comprises the steps of:

- loading the movable gripping unit with tubular plastic film;
- directing the movable gripping unit to be placed between the first and second conveyors, whereby the gripping arms are positioned axially with the conveyors;
- activating the first conveyor to transport the object toward the movable gripping unit, wherein the object moves along and in between the gripping arms;
- activating the gripping unit to release film from the gripping arms onto the object while the object moves towards the second conveyor;

- set of reciprocating elements that can be forced together in order to press against the outer surface of the film, while the cutting device and welding device, which is placed between the set of reciprocating elements, cuts and welds the film thereby generating two closed ends; and
- moving the object with closed ends to the second conveyor to transport the packaged object away from the gripping unit.

The present invention also provides an apparatus comprising the set of reciprocating elements that can be forced together in order to press against the outer surface of the film, while the cutting device and welding device, which is placed between the set of reciprocating elements, cuts and welds the film thereby generating two closed ends. This apparatus is suitable for being implemented in both the system for packaging objects of the present invention as well as prior art packaging machines.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a sectional view of the elements adapted for cooperating with each other for temporarily holding the film, said elements enclosing a cutting device and a welding device.

FIG. 2 shows the packing of long objects.

FIG. 3 shows a prior art example of a system for packaging objects with a tubular plastic film.

DETAILED DESCRIPTION OF THE INVENTION

Identical components are given the same designations in the text which follows and are provided with the same reference signs in the drawings.

Figure 1 shows a sectional view of the elements (10) adapted for cooperating with each other for temporarily holding the film (11), said elements (10) enclosing a cutting device (12) and a welding device (13). The steps carried out by the present invention includes

the loading of the gripping unit (2) with tubular plastic film (11); directing the gripping unit (2) to be placed between the first (5) and second (6) conveyors, whereby the gripping arms (3) are positioned axially with the conveyors (5, 6); activating the first conveyor (5) to transport the object (7) toward the gripping unit (2), wherein the object (7) moves along and in between the gripping arms (3); activating the gripping unit (2) to release film (11) from the gripping arms (3) onto the object (7) while the object (7) moves towards the second conveyor (6); activating the set of reciprocating elements (10) thereby forcing them together in order to press against the outer surface of the film (11), while the cutting device (12) and welding device (13), which is placed between the set of reciprocating elements (10), cuts and welds the film (11) thereby generating one or two closed ends; and moving the object (7) with closed ends to the second conveyor (6) to transport the packaged object (7) away from the gripping unit (2).

Figure 2 shows the packing of long objects. According to the invention it is achieved by configuring the gripping unit to accommodate a long object (7) by consecutively releasing two tubular film (11) segments along the object (7). Importantly these segments overlap with each other along the length of the object (7) and may be held in place by gluing or by a band, such as a strip.

Figure 3 shows a prior art system (1), which is also applicable for performing the present invention. The system includes a movable packaging frame (2) having four horizontally oriented gripping arms (3) for holding and stretching tubular (stretchable) film (11). A rail system is used for moving the packaging frame from film storage and dispensing means (4) to the area between the first (5) and second (6) conveyors. In the shown embodiment two packaging frames and two film storage and dispensing means are provided; in such a configuration one of the packaging frames may be gathering stretch foil while the other is ungathering stretch foil onto the object to packaged. Each gripping arm is equipped with opposing and activated rollers which can be brought into contact with the film, whereby activation of the rollers enable the film to be gathered onto and ungathered from the gripping arms. The gripping arms are independently and laterally movable to achieve stretching of the film. There is shown a first conveyor for supporting the object and transporting it toward the packaging frame so that the object is delivered between the gripping arms. This first conveyor transports the object perpendicular to the packaging frame and in an axis parallel with the gripping arms.

The second conveyor, which is placed next to the packaging frame, supports the object and transports it away from the packaging frame.

CLAIMS

1. A system (1) for packaging objects with a tubular plastic film, said system comprises:
   - a gripping unit (2) having a plurality of horizontally oriented gripping arms (3) for holding the tubular plastic film (11) and for releasing it onto an object (7);
   - a first conveyor (5) for supporting the object (7) and transporting it toward the gripping unit (2) in an axis parallel with the gripping arms (3) so that the object (7) is delivered between the gripping arms (3);
   - a second conveyor (6) for supporting the object (7) and transporting it away from the gripping unit (2), said second conveyor (6) placed next to the gripping unit (2), which during packaging is placed between the first (5) and second conveyors (6);
   - elements (10) adapted for cooperating with each other for temporarily holding the film (11), said elements enclosing a cutting device (12) and a welding device (13), said elements (10) positioned at the end of the first conveyor (5); and
   - a control unit.

2. System according to claim 1, wherein the elements (10) adapted for cooperating with each other for holding the film comprise a set of reciprocating elements (10) that can be forced together in order to press against the outer surface of the film (11), while the cutting device (12) and welding device (13), which is placed between the set of reciprocating elements (10), cuts and welds the film (11) thereby generating two closed ends.

3. System according to claim 1 or 2, wherein an additional welding device (13') is adopted between the elements (10) adapted for cooperating with each other for holding the film, said welding device (13) and said additional welding device (13') flanking the cutting device (12).

4. System (1) to any one of the claims 1 to 3, wherein the control unit is programmed to execute the following steps:
   - loading the gripping unit (2) with tubular plastic film (11);
   - ensuring that the gripping unit (2) is placed between the first (5) and second (6) conveyors, whereby the gripping arms (3) are positioned axially with the conveyors (5, 6);

- activating the first conveyor (5) to transport the object (7) toward the gripping unit (2), wherein the object (7) moves along and in between the gripping arms (3);
- activating the gripping unit (2) to release film (11) from the gripping arms (3) onto the object (7) while the object (7) moves towards the second conveyor (6);
- activating the set of reciprocating elements (10) thereby forcing them to press against the outer surface of the film (11), while the cutting device (12) and welding device (13), which is placed between the set of reciprocating elements (10), cuts and welds the film (11) thereby generating a closed end in the film (11) covering the object (7); and
- moving the object (7) with closed ends to the second conveyor to transport the packaged object away from the gripping unit.

5. System according to any one of the claims 1 to 4, wherein the gripping unit (2) is loadable with tubular plastic film (11) for packaging at least 3 objects (7).

6. System according to any one of the claims 1 to 5, wherein the gripping unit (2) is movable.

7. System according to claim 6, wherein the gripping unit (2) is movable, such as on a track, between a station for loading the gripping unit (2) and the space between the first (5) and second (6) conveyors, where packaging of the object (7) is performed.

8. System according to any one of the claims 1 to 7, wherein the system is configured to accommodate a long object (7) by consecutively releasing two tubular film (11) segments along the object (7), said segments overlapping each other along the length of the object.

.

9. Method for packaging objects tubular film (11) with the system of any one of the claims 1 to 8, said method comprises the steps of:
   - loading the gripping unit (2) with tubular plastic film (11);

- directing the gripping unit (2) to be placed between the first (5) and second (6) conveyors, whereby the gripping arms (3) are positioned axially with the conveyors (5, 6);
- activating the first conveyor (5) to transport the object (7) toward the gripping unit (2), wherein the object (7) moves along and in between the gripping arms (3);
- activating the gripping unit (2) to release film (11) from the gripping arms (3) onto the object (7) while the object (7) moves towards the second conveyor (6);
- activating the set of reciprocating elements (10) thereby forcing them together in order to press against the outer surface of the film (11), while the cutting device (12) and welding device (13), which is placed between the set of reciprocating elements (10), cuts and welds the film (11) thereby generating one or two closed ends; and
- moving the object (7) with closed ends to the second conveyor (6) to transport the packaged object (7) away from the gripping unit (2).

10. Method according to claim 9, wherein the gripping unit (2) is configured to accommodate a long object (7) by consecutively releasing two tubular film (11) segments along the object (7), said segments overlapping each other along the length of the object (7).

11. Method of claim 10, wherein the overlapping segments are held in place by gluing or by a band, such as a strip.

12. An apparatus for holding a tubular film (11) while said film is being welded an cut, said apparatus comprising elements (10) adapted for cooperating with each other for temporarily holding the film (11), said elements enclosing a cutting device (12) and a welding device (13).

13. The apparatus according to claim 12, wherein the elements (10) adapted for cooperating with each other for holding the film comprise a set of reciprocating elements (10) that can be forced together in order to press against the outer surface of the film (11), while the cutting device (12) and welding device (13), which is placed between the set of reciprocating elements (10), cuts and welds the film (11) thereby generating two closed ends.

14. The apparatus according to claim 12 or 13, wherein the apparatus comprises an additional welding device (13') placed between the elements (10) adapted for cooperating with each other for holding the film, said welding device (13) and said additional welding device (13') flanking the cutting device (12).

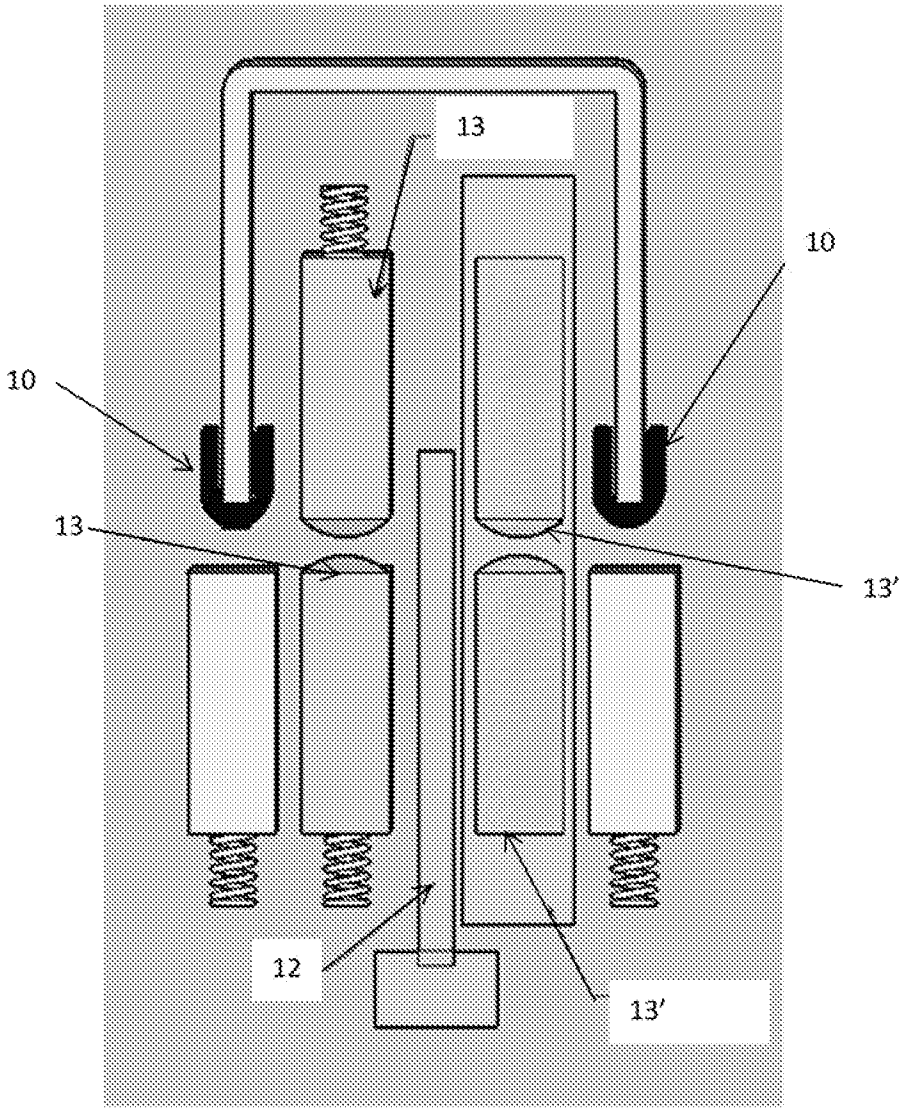

Figure 1

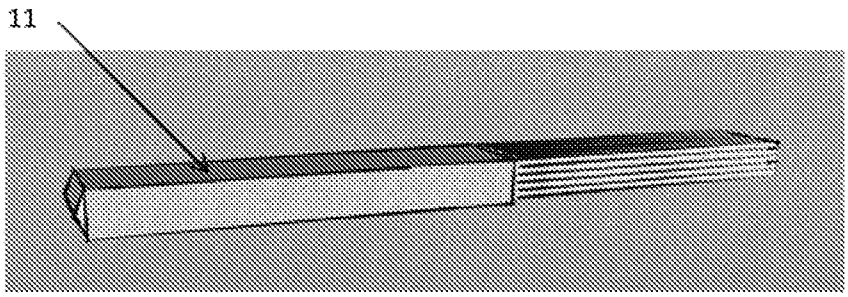

Figure 2A

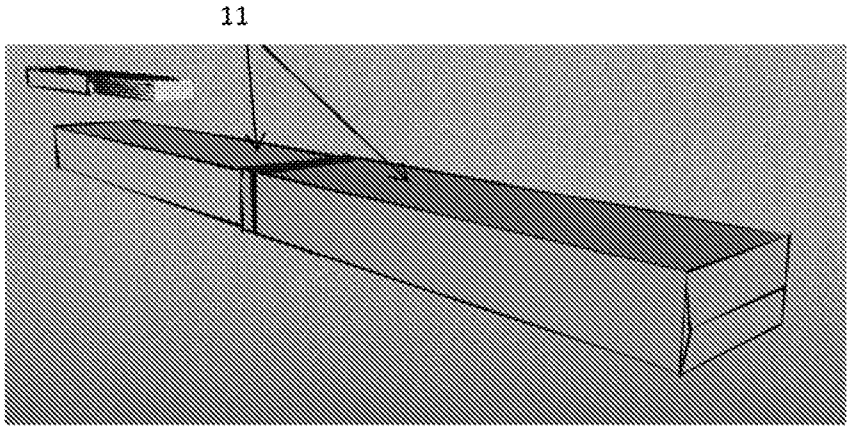

Figure 2B

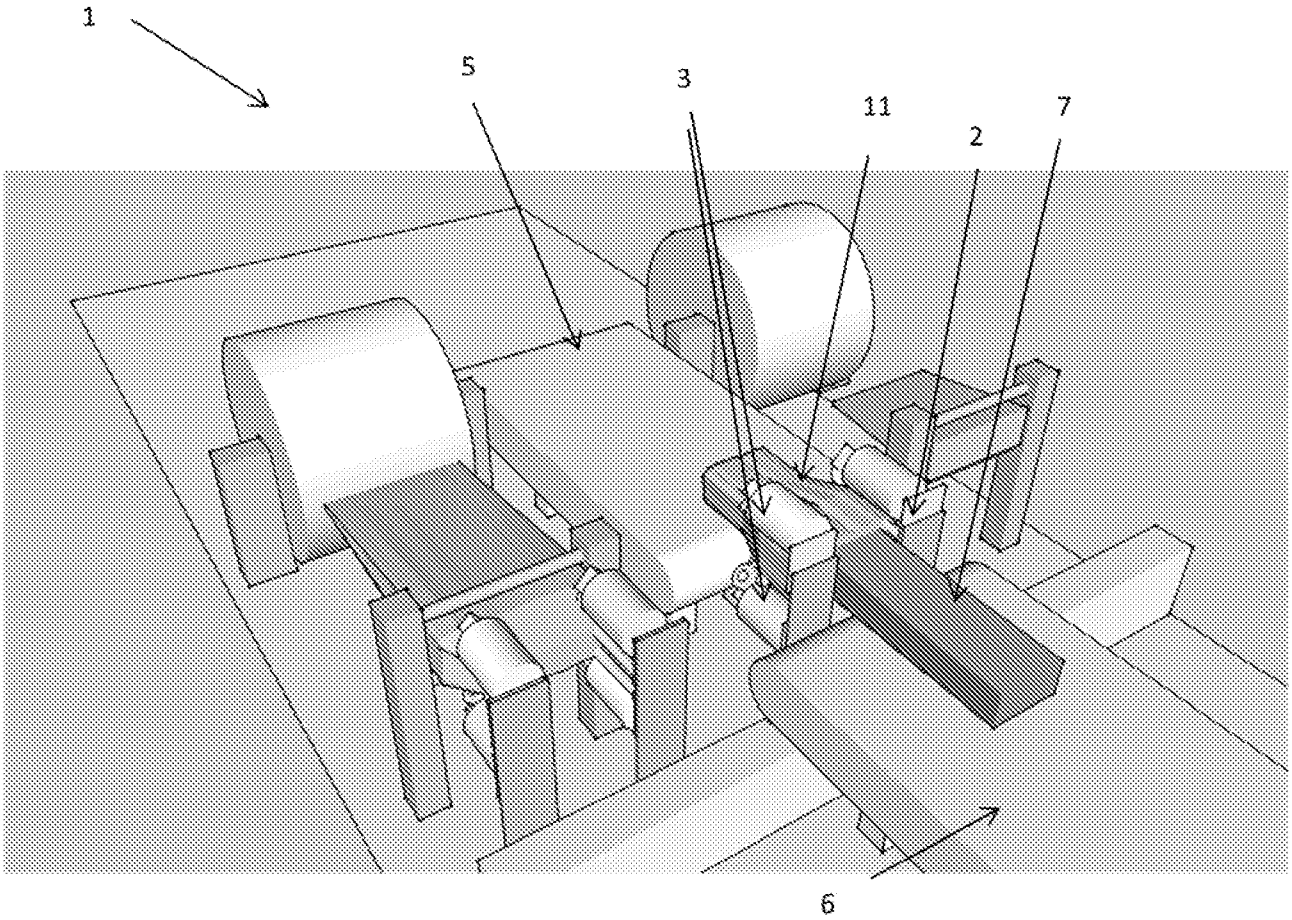

Figure 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2018/050213

A. CLASSIFICATION OF SUBJECT MATTER

B65B 9/14 (2006.01), B65B 39/02 (2006.01), B65B 41/12 (2006.01), B65B 43/34 (2006.01)

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, CPC: B65B

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

DK, NO, SE, FI: Classes as above.

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

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 2886268 A1 (CRYOVAC, INC.) 24 June 2015, see abstract, [0089] and figures 1A-2.	12-14 1-11
X A	EP 3115302 A1 (ULMA PACKAGING TECHNOLOGICAL CENTER) 11 January 2017, see abstract, [0035] and figures 6a-6c.	12-14 1-11
A	DE 202009008118 U1 (BECKLOENNE) 12 December 2009, see abstract, [0025]-[0029] and figures.	1-14
A	WO 2016/070883 A1 (FRANK BRUHN APS) 12 May 2016, see abstract and figures. Cited in the application.	1-14
A	US 2013/0291485 A1 (MCCORKLE, T. J. et al.) 7 November 2013, see abstract.	1-14
A	EP 2799345 A1 (CUT VERWALTUNG UG) 5 November 2014, see abstract.	1-14
A	WO 2008/146160 A2 (PHILIPS MORRIS PRODUCTS S.A.) 4 December 2008, see abstract.	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	Date of mailing of the international search report
17/10/2018	22/10/2018
Name and mailing address of the ISA Nordic Patent Institute Helgeshøj Allé 81 DK - 2630 Taastrup, Denmark. Facsimile No. + 45 43 50 80 08	Authorized officer Anders Budtz-Olsen Telephone No. +45 43 50 83 34

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2018/050213

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2018/050213

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2018/050213

Patent document cited in search report / Publication date	Patent family member(s) / Publication date
EP 2886268 A1 2015.06.24	EP 2886268 B1 2017.02.15 US 2015175288 A1 2015.06.25 AU 2014268746 A1 2015.07.09 BR 102014031961 A2 2015.10.06 NZ 703121 A 2017.10.27
EP 3115302 A1 2017.01.11	EP 3115302 B1 2017.05.31 WO 2017005551 A1 2017.01.12 PT 3115302T T 2017.08.08 ES 2631129T T3 2017.08.28 DK 3115302T T3 2017.09.04 AR 105263 A1 2017.09.20 PL 3115302T T3 2017.11.30 NO 20180064 A1 2018.01.16 AU 2016290414 A1 2018.02.01 AU 2016290414B B2 2018.02.22 SE 1850133 A1 2018.02.06 CN 107810144 A 2018.03.16 MX 2017016342 A 2018.05.02 US 2018127128 A1 2018.05.10 JP 2018521917 A 2018.08.09 JP 6382474B B2 2018.08.29
DE 202009008118U U1 2009.11.12	NONE
WO 2016070883 A1 2016.05.12	DK 178374B B1 2016.01.18 EP 3215421 A1 2017.09.13 EP 3215421 A4 2018.09.19 US 2017334586 A1 2017.11.23
US 2013291485 A1 2013.11.07	WO 2013156854 A2 2013.10.24 WO 2013156854 A3 2014.04.03 US 9617021 B2 2017.04.11 AU 2013250887 A1 2014.10.02
EP 2799345 A1 2014.11.05	EP 2799345 B1 2016.09.07 DE 102013007625 A1 2014.11.06 PL 2799345T T3 2017.05.31
WO 2008146160 A2 2008.12.04	WO 2008146160 A3 2009.01.29 US 2009113852 A1 2009.05.07 US 8402724 B2 2013.03.26