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(54) **Packaging method and unit, particularly for substantially cylindrical elements**

(57) A packaging unit, particularly for substantially cylindrical elements, comprising means (2) for moving a substantially cylindrical element (3) to be packaged and a dispenser (4) of film (5), which is adapted to package the element (3), the packaging unit (1) comprising at least one electrostatic field generator, which is adapted to induce a difference in electrostatic potential between the element (3) and the film (5), the difference in electrostatic potential causing the adhesion of the film (5) to the element (3).

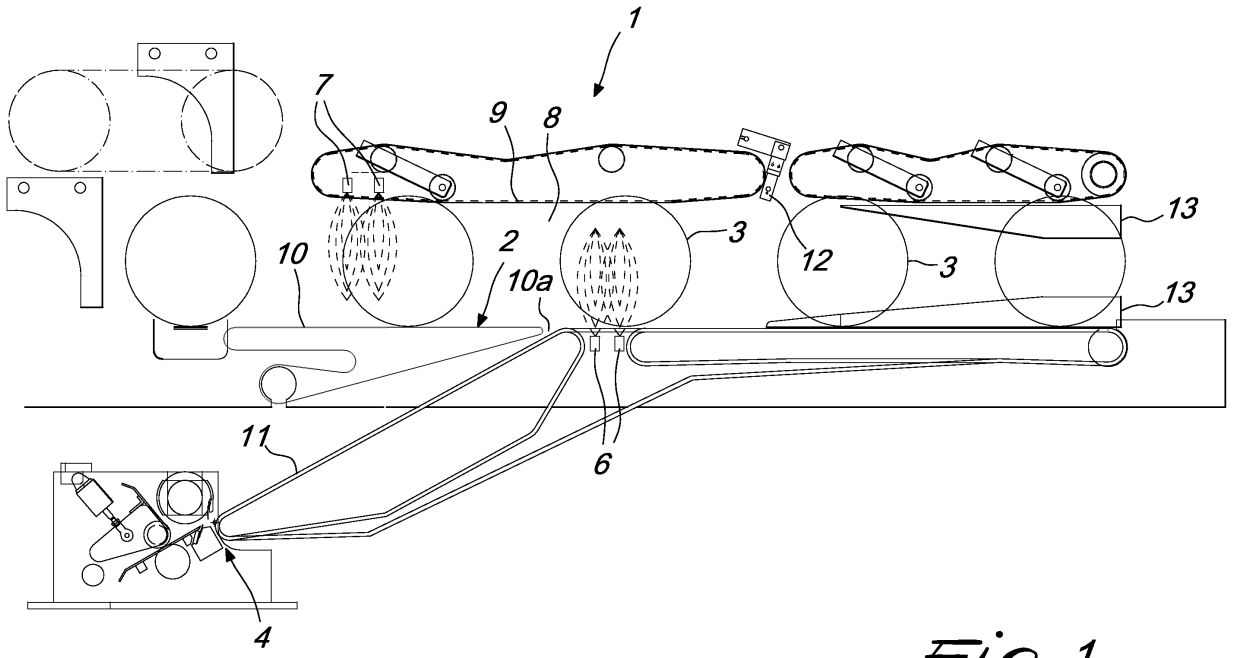

Fig. 1

EP 2 033 895 A1

Description

[0001] The present invention relates to a packaging unit, particularly for substantially cylindrical elements, such as for example rolls of absorbent paper or the like.

[0002] Automatic machines are currently known which are capable of packaging rolls of paper and the like. These are machines in which at least one stage is dedicated to wrapping a ribbon made of polymer or other similar materials onto such roll.

[0003] One of the most common ways to obtain the desired winding is to make the roll perform a translational motion toward at least one portion of film, spread flat beforehand, until it rests against it; subsequent advancement of the roll against the surface of the film entails its partial wrapping therein, which is followed by the activation of other elements, which belong to a folding station, capable of completing the wrapping of the roll also on its two ends. Finally, a heat-sealing device allows to complete the packaging operation.

[0004] A first drawback observed as a consequence of the technique that is used is that the film is scarcely stretched and therefore adheres poorly to the roll, generating an unpleasant aesthetic effect, which is particularly severe considering that the resulting packaging is in practice the one with which the product is presented to the end customer.

[0005] Such drawback can be solved by trying to bring the film into contact with the roll with a certain preloading, but for applications related to absorbent paper, toilet paper or the like, which are characterized by low rigidity, the result obtained is that the roll itself becomes deformed.

[0006] In order to solve the above-mentioned drawback, machines are known which have a station, arranged after the ones described, in which the film is made to adhere to the roll by heat-shrinking; in this case, the film must be made of a suitable material, such as polyethylene, PVC or any other heat-shrink material.

[0007] However, even this solution is not free from drawbacks, the first of which is evident and is constituted by the increase in cost and by the structural complexity linked to the insertion of an additional station in the automatic machine.

[0008] Further, the heat-shrink treatment leads to a deformation of the material, which compromises the quality of any images, lettering or other graphic markings printed on the film, which are needed to customize and sell the product. It is therefore necessary to provide a further station in order to insert, between the roll and the film, an element, such as for example a sheet of paper or cardboard, on which the desired graphic markings are provided, with the consequent additional structural complication.

[0009] The aim of the present invention is to solve the above-mentioned drawbacks, by providing a packaging unit, particularly for substantially cylindrical elements, which is capable of ensuring correct adhesion of the film to the roll to be wrapped, without therefore the need to provide an additional tensioning unit in the automatic machine.

[0010] Within this aim, an object of the invention is to provide a packaging unit by means of which correct adhesion of the film to the roll does not depend on the type of material used.

[0011] Another object of the invention is to provide a packaging unit that allows to use preprinted films without compromising the quality of the applied graphic markings.

[0012] Another object of the invention is to provide a packaging unit that ensures high reliability in operation.

[0013] Another object of the invention is to provide a packaging unit that can be obtained easily starting from commonly commercially available elements and materials.

[0014] Another object of the invention is to provide a packaging unit that has low costs, is relatively simple to provide in practice and is safe in application.

[0015] This aim and these and other objects, which will become better apparent hereinafter, are achieved by a packaging unit, particularly for substantially cylindrical elements, which comprises means for moving a substantially cylindrical element to be packaged and a dispenser of a film, which is adapted to package the element, characterized in that it comprises at least one electrostatic field generator, which is adapted to induce a difference in electrostatic potential between the element and the film, the difference in electrostatic potential causing the adhesion of the film to the element.

[0016] Further characteristics and advantages of the invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of the packaging unit according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic side elevation view of the packaging unit according to the invention;

Figures 2 to 4 are perspective views of a detail of Figure 1 illustrating the operation of the unit according to the invention;

Figures 5 to 7 are schematic side elevation views of the operation of the packaging unit according to the invention.

[0017] With reference to the figures, a packaging unit according to the invention, generally designated by the reference numeral 1, comprises movement means 2, for a substantially cylindrical element 3 to be packaged, and a dispenser 4 for film 5 adapted to package the element 3.

[0018] In particular, the movement means 2 comprise at least one conveyor belt, which forms, with respect to a suitable reference, a guiding duct 8 for the element 3.

[0019] More particularly, the movement means 2 comprise a first series 9 of conveyor belts, which is arranged so as to be substantially parallel to a second series 10

of conveyor belts, which in practice constitutes such suitable reference. The conveyor belts of the first series 9 move at a different speed with respect to those of the second series 10, so as to force the element 3, interposed between them, to perform a rolling motion along the guiding duct 8 delimited by them.

[0020] The second series 10 has a region of discontinuity 10a, so that a movable platform 11 that belongs to the dispenser 4, which moves the film 5, can reach the guiding duct 8; in this manner, the film 5 is made substantially to face the lateral surface of the element 3.

[0021] According to the invention, the unit 1 comprises at least one electrostatic field generator, which is adapted to induce a difference in electrostatic potential between the element 3 and the film 5, this difference causing the adhesion of the film 5 to the element 3 during the advancement of the latter by rolling.

[0022] In particular, the electrostatic field generator induces a preset electrostatic potential on the film 5, which is due to a surface accumulation of electrostatic charge; the film 5 can thus cling to the lateral surface of the element 3 in order to provide the desired wrapping.

[0023] In order to apply the desired surface accumulation of electrostatic charge, the unit 1 according to the invention comprises at least one induction electrode, which is connected electrically to the electrostatic field generator.

[0024] Conveniently, the unit 1 comprises two electrostatic field generators: the first one is preferably a 60-kV generator, in any case in a range between 15 and 150 kV, for inducing a first preset electrostatic potential produced by a first surface accumulation of electrostatic charge, on the film 5, and the second one is instead preferably a 25-kV generator, in any case in a range between 1 and 50 kV, in order to induce a second preset electrostatic potential, of opposite sign with respect to the first one, produced by a second surface accumulation of electrostatic charge, on the element 3.

[0025] In particular, the first electrostatic potential has a positive sign, while the second one has a negative sign.

[0026] To apply the desired charge accumulations, the unit 1 according to the invention thus comprises at least one first induction electrode 6 and at least one second induction electrode 7, which are respectively connected electrically to the first generator and to the second generator, and are arranged correspondingly along the paths traced by the film 5 and by the element 3 in order to form the first accumulation and the second accumulation of electrostatic charge.

[0027] More particularly, the first induction electrode 6 is arranged proximate to the region of discontinuity 10a, in order to apply the first charge accumulation to the surface of the film 5, while the second induction electrode 7 is arranged along the guiding duct 8, in order to apply the second charge accumulation to the lateral surface of the element 3 during its rolling.

[0028] In this manner, when, indeed proximate to the region of discontinuity 10a, the film 5 faces the lateral surface of the element 3, the induced potential difference causes the film 5 to adhere at least to a portion of such lateral surface; the element 3 then continues to roll along the guiding duct 8, thus allowing the film 5 to completely wrap around the lateral surface of the element 3.

[0029] The accompanying figures show, by way of illustration which does not limit the application of the invention, a line on which the unit 1 according to the invention is installed.

[0030] Advantageously, the packaging unit 1 according to the invention can also comprise an adhesive dispenser, which is functionally associated with at least one of the surfaces of the element 3 or of the film 5 and is arranged substantially upstream of the region of discontinuity 10a, in order to facilitate the adhesion of the film 5 to the element 3, particularly if any electrostatic charges accumulated by the film 5 or by the element 3, as sometimes occurs during the preceding steps of processing, might compromise their correct adhesion. For example, the dispenser can deposit a predefined amount of adhesive on the film 5, being arranged proximate to a portion of the movable platform 11.

[0031] It should be noted that in order to complete the packaging operations, downstream of the region of discontinuity 10a, along the guiding duct 8 or on an extension thereof, there are means for heat-sealing the overlapping flaps of the film 5, which are constituted for example by a bar 12, which is heated by an electric resistor which is arranged along the first series 9 of conveyor belts. The element 3, wrapped by the film 5, during its advancement by rolling, moves proximate to the bar 12, always with such an orientation as to place the bar 12 in contact with the portion of the lateral surface provided with the two overlapping laps, which are thus fixed. Further, the bar 12 is associated with a pneumatic cylinder, which moves it away from the element 3 if the machine stops.

[0032] Subsequently, there are devices for closing the ends of the element 3, which comprise for example two plates 13 which are arranged laterally to the guiding duct 8, at a distance that is slightly greater than the length of the element 3, in order to be able to fold, again by way of the rolling motion imparted to the latter, the protruding portions of film 5 onto the upper and lower surfaces.

[0033] In order to complete the packaging, finally there is a device that is capable of performing the final heat-sealing and is constituted for example by a pair of Teflon-coated belts, which slide above spring-loaded heating units and are moved into contact with the upper and lower surfaces of the element 3, thus heat-sealing the previously folded film 5. By way of the movement of two linear actuators, the heating units can be moved away from the belts if the machine stops.

[0034] The method for packaging substantially cylindrical elements 3 associated with a unit 1 entails feeding the movement means 2 with at least one element 3.

[0035] Simultaneously, it is necessary to feed the dispenser 4 with one film 5, which is unwound from a suitable

feeder.

[0036] In particular, according to a possible embodiment of particular interest, which however does not limit the application of the invention, the element 3 can have a substantially tubular shape and can be constituted by a continuous winding of paper on a cylindrical core; such paper can be of the type of toilet paper and absorbent paper, i.e., materials suitable for the surface accumulation of electrostatic charge introduced by the electrostatic field generators.

[0037] The element 3 must then be moved by the movement means 2. In particular, as already noted, the different speed of the first series 9 and of the second series 10 of conveyor belts allows to impart to the element 3 a rolling motion, according to which it advances along a preset direction, defined by the guiding duct 8.

[0038] Along such preset rolling direction of the element 3, there is an area of interference, for example, with reference to the accompanying figures, in the region of discontinuity 10a, toward which the film 5 is brought by means of the dispenser 4.

[0039] It is therefore necessary to induce a difference in electrostatic potential between the element 3 and the film 5; as mentioned earlier, this effect is achieved, in a possible application of the unit 1 according to the invention, by means of the first electrostatic field generator and of the connected first induction electrode 6, which is capable of inducing the first preset electrostatic potential on the film 5; then, by means of the second electrostatic field generator, connected to the second induction electrode 7, a second preset electrostatic potential is induced on the element 3, in order to enhance the effect and discharge from the element 3 any charges accumulated during the preceding steps of processing.

[0040] At this point, the dispenser 4 moves the film 5 so that it faces the lateral surface of the element 3, which is rolling along the guiding duct 8; the difference in induced electrostatic potential then causes the adhesion of the film 5 to such lateral surface of the element 3.

[0041] Substantially before the film 5 is brought to face the lateral surface of the element 3, it is possible to provide an adhesive dispenser, which deposits a predefined amount of adhesive on at least one of the surfaces of the element 3 or of the film 5 in order to facilitate its adhesion.

[0042] By then making the rolling of the element 3 continue, completion of the wrapping thereof by the film 5 is achieved.

[0043] The process is then completed by the steps for closing the film 5 onto itself and around the element 3.

[0044] In practice it has been found that the packaging unit according to the invention achieves the proposed aim, since the adhesion of the film 5 to the element 3 provided by electrostatic attraction, as a consequence of the induced electrostatic potential difference, allows to obtain, without the need for further devices or stages on the machine, a correctly tensioned wrapping, regardless of the material of which the film 5 is made, without running the risk of a deterioration of the quality of the images or graphic markings printed thereon.

[0045] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; all the details may further be replaced with other technically equivalent ones.

[0046] It is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0047] In practice, the materials used, as well as the dimensions, may be any according to requirements and to the state of the art.

[0048] The disclosures in Italian Patent Application No. BO2007A000603 from which this application claims priority are incorporated herein by reference.

[0049] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A packaging unit (1), particularly for substantially cylindrical elements, comprising means (2) for moving a substantially cylindrical element (3) to be packaged and a dispenser (4) of film (5), which is adapted to package the element (3), **characterized in that** it comprises at least one electrostatic field generator, which is adapted to induce a difference in electrostatic potential between the element (3) and the film (5), the difference in electrostatic potential causing the adhesion of the film (5) to the element (3).

2. The unit according to claim 1, **characterized in that** said at least one electrostatic field generator is adapted to induce a preset electrostatic potential, caused by the surface accumulation of electrostatic charge on the film (5).

3. The unit according to claims 1 and 2, **characterized in that** said at least one electrostatic field generator is adapted to induce a preset electrostatic potential, which is comprised generally between1 kV and 150 kV.

4. The unit according to one or more of the preceding claims, **characterized in that** it comprises at least one induction electrode, which is connected electrically to said at least one electrostatic field generator, for surface accumulation of the electrostatic charge on the film (5).

5. The unit according to one or more of the preceding claims, **characterized in that** it comprises two elec-

trostatic field generators: a first generator, for inducing a first preset electrostatic potential, due to a first surface accumulation of electrostatic charge, on the film (5), and a second generator, for inducing a second preset electrostatic potential, of opposite sign with respect to the first one, due to a second surface accumulation of electrostatic charge, on the element (3).

6. The unit according to one or more of the preceding claims, **characterized in that** it comprises at least one first induction electrode (6) and at least one second induction electrode (7), which are connected electrically respectively to said first generator and to said second generator and are arranged correspondingly along the paths of the film (5) and of the element (3), in order to form the first accumulation and the second accumulation of electrostatic charge.

7. The unit according to one or more of the preceding claims, **characterized in that** said movement means (2) comprise at least one conveyor belt, which forms, with respect to a suitable reference, a duct (8) for guiding the element (3), said at least one second induction electrode (7) being arranged so as to face said guiding duct (8).

8. The unit according to one or more of the preceding claims, **characterized in that** said movement means (2) comprise a first series (9) of said conveyor belts and a second series (10) of said conveyor belts, which are arranged in a substantially mutually parallel arrangement so as to delimit said guiding duct (8) for the element (3), said conveyor belts of said first series (9) having a different speed with respect to said conveyor belts of said second series (10), in order to cause the rolling of the element (3) thereon, said suitable reference being constituted by said second series (10).

9. The unit according to one or more of the preceding claims, **characterized in that** said dispenser (4) comprises a movable platform (11) for moving the film (5), said movable platform (11) leading to said guiding duct (8) in a region of discontinuity (10a) of said second series (10), said first induction electrode (6) being arranged proximate to said region of discontinuity (10a).

10. The unit according to one or more of the preceding claims, **characterized in that** it comprises an adhesive dispenser, which is functionally associated with at least one of the surfaces of said element (3) and of said film (5), which is arranged substantially upstream of said region of discontinuity (10a), in order to facilitate the adhesion of the film (5) to the element (3).

11. The unit according to claim 10, **characterized in that** said adhesive dispenser is arranged proximate to a portion of said movable platform (11), in order to deposit a predefined quantity of adhesive on the film (5), in order to facilitate its adhesion to the element (3).

12. A packaging method, particularly for substantially cylindrical elements, according to claim 1, which comprises the steps of:

- ➢ feeding said movement means (2) with at least one element (3),
- ➢ feeding said dispenser (4) with a film (5),
- ➢ moving, by way of said movement means (2), the element (3) with a rolling motion along a preset direction,
- ➢ moving the film (5), by way of said dispenser (4), toward an area of interference with said preset rolling direction of the element (3),
- ➢ inducing a difference in electrostatic potential between the element (3) and the film (5),
- ➢ moving, during the rolling of the element (3), the film (5) so that it faces the lateral surface of the element (3), the difference in electrostatic potential causing the adhesion of the film (5) to the element (3),
- ➢ completing the wrapping of the film (5) on the element (3) by means of the rolling of the element (3),
- ➢ closing onto itself said film (5) wrapped around said element (3).

13. The method according to claim 12, **characterized in that** it comprises the step of feeding said movement means (2) with elements (3), which have a substantially tubular shape and are constituted by a continuous winding of paper onto a cylindrical core, paper such as toilet paper and absorbent paper, materials suitable for the surface accumulation of an electrostatic charge induced by said at least one electrostatic field generator.

14. The method according to claims 12 and 13, **characterized in that** before moving the film (5) so that it faces the lateral surface of the element (3), an adhesive dispenser, arranged substantially upstream of the area of interference, deposits a predefined amount of adhesive on at least one of the surfaces of the film (5) and of the element (3) in order to facilitate their mutual adhesion.

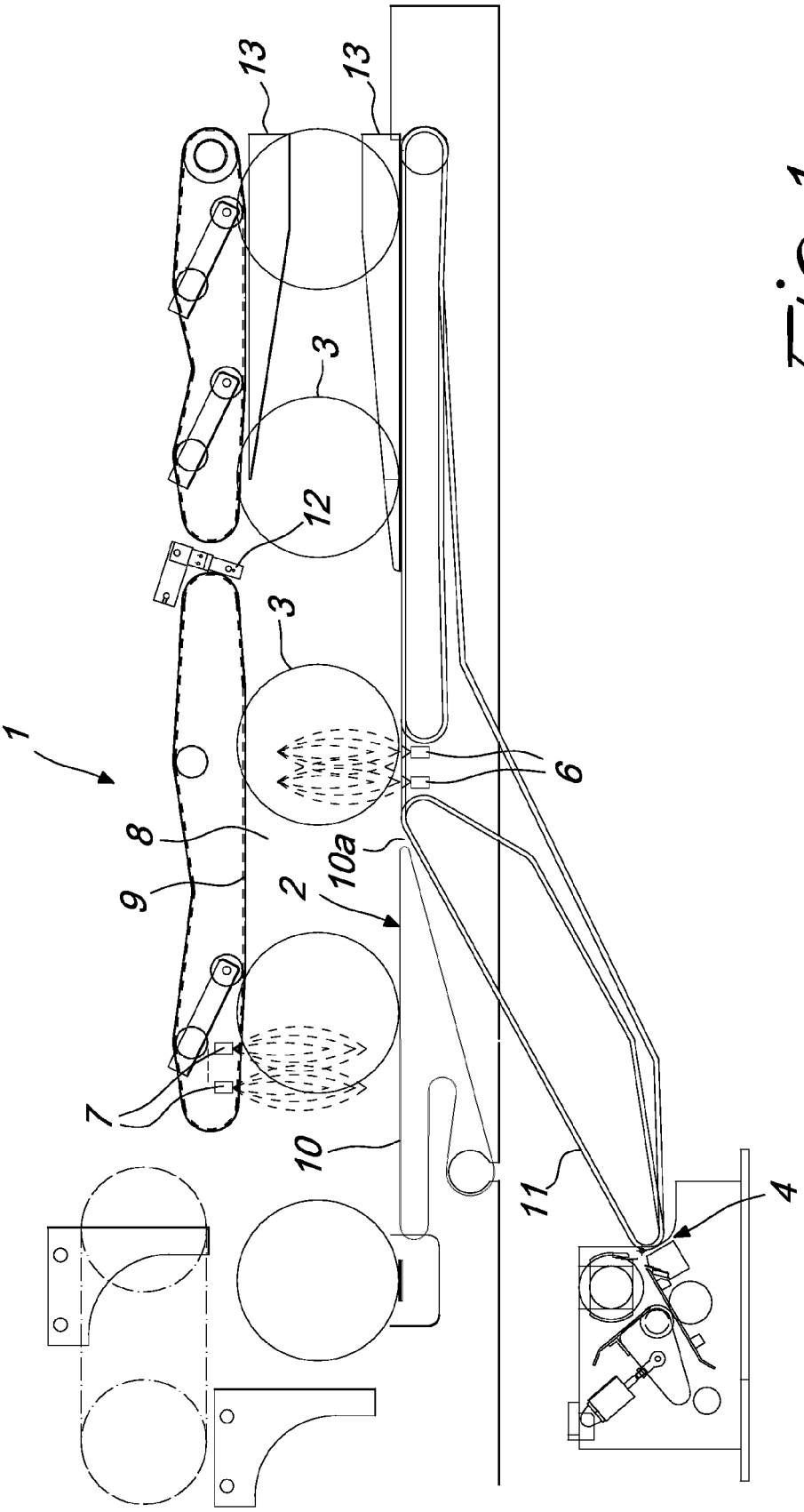

Fig. 1

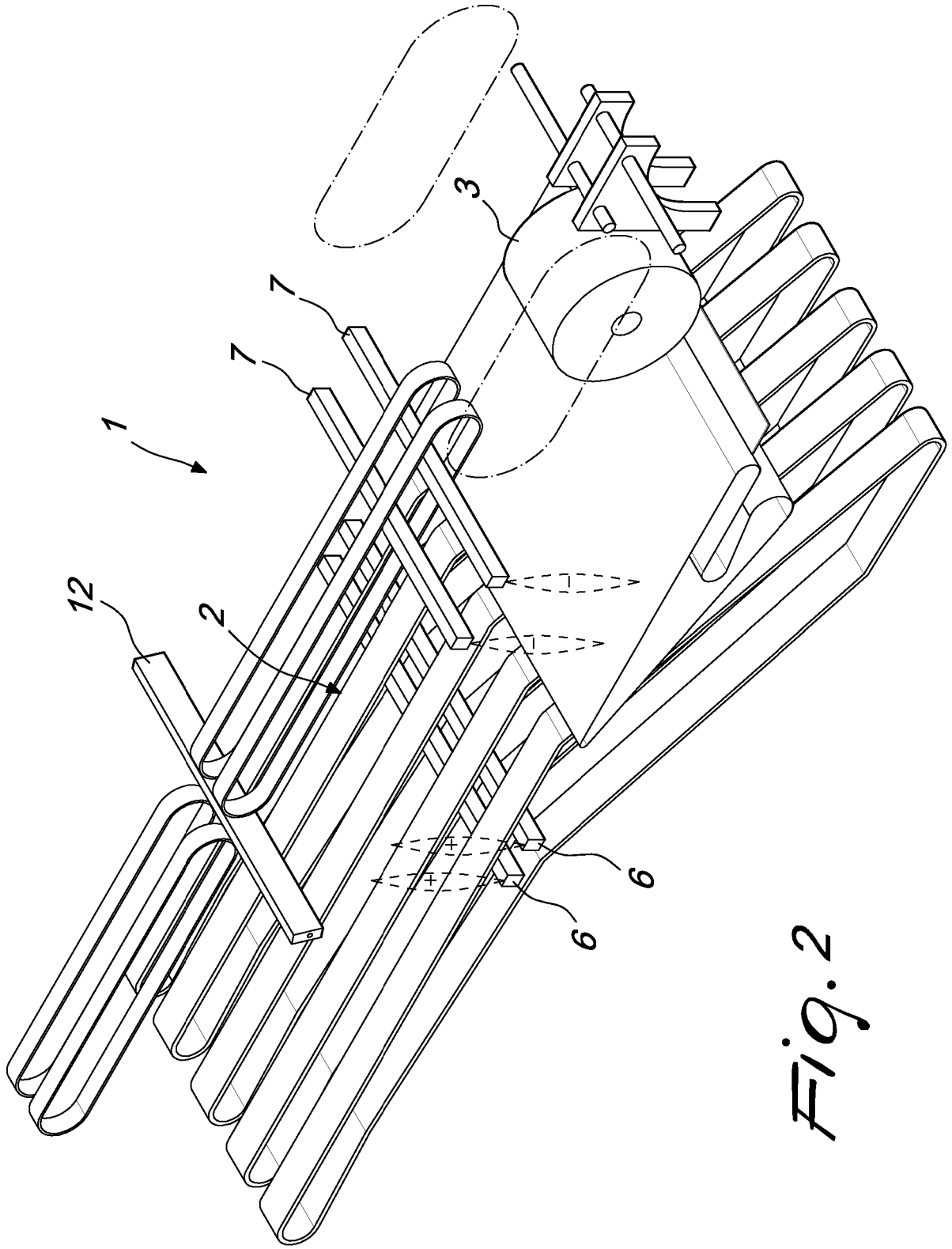

Fig. 2

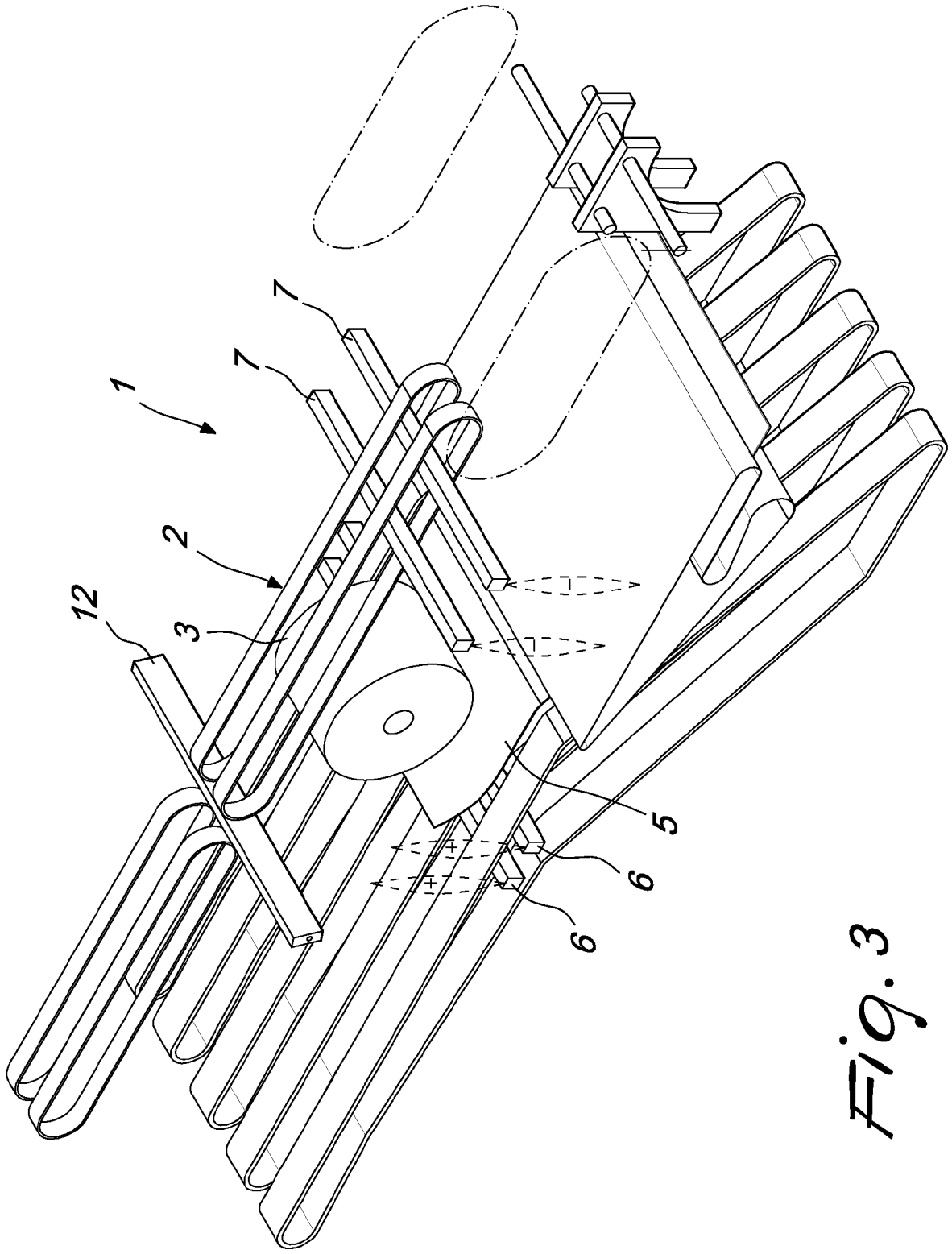

Fig. 3

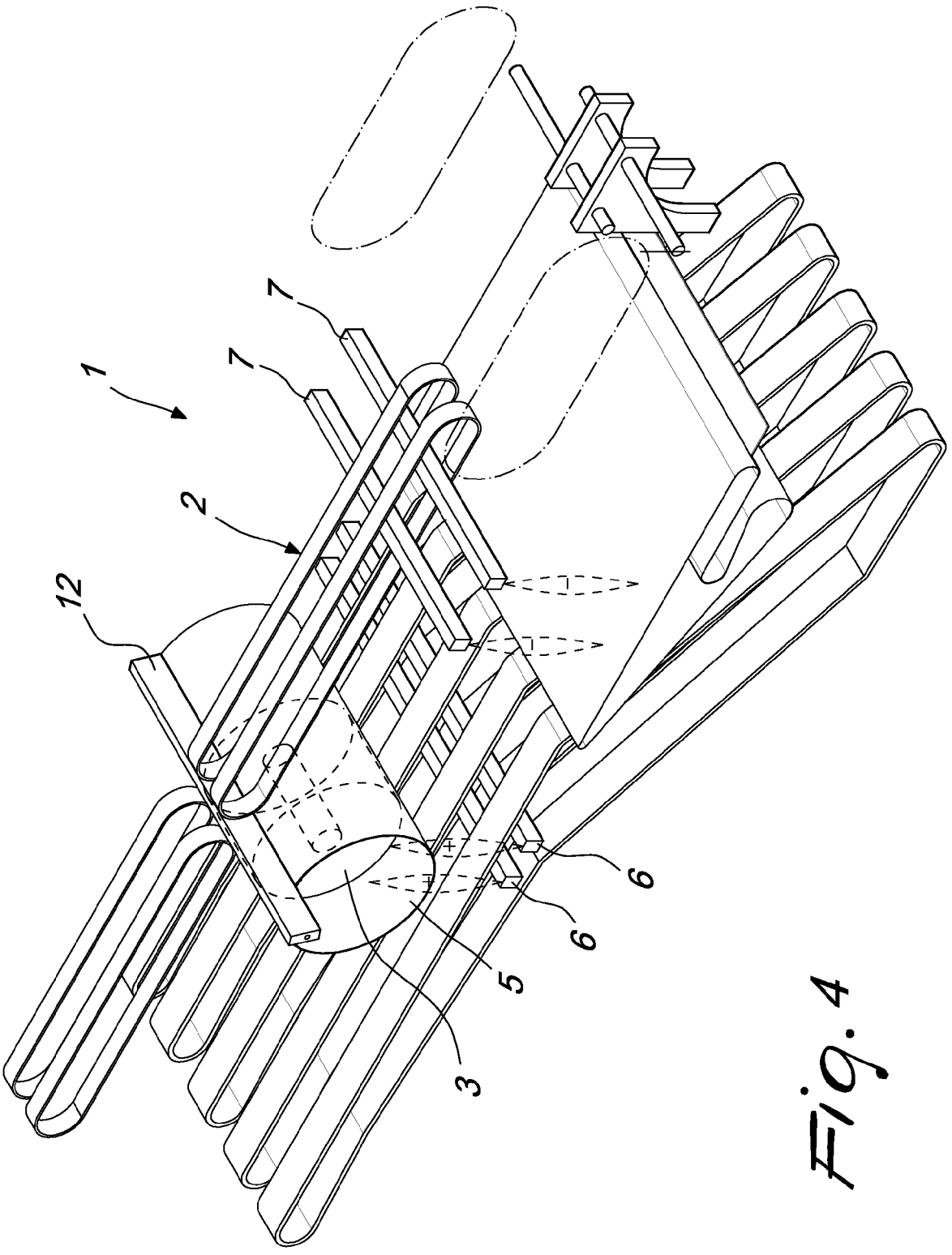

Fig. 4

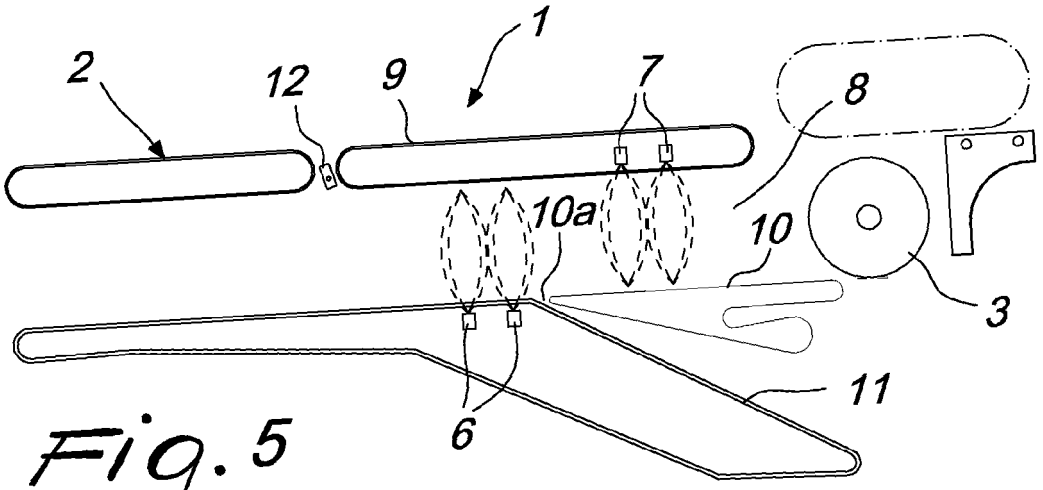

Fig. 5

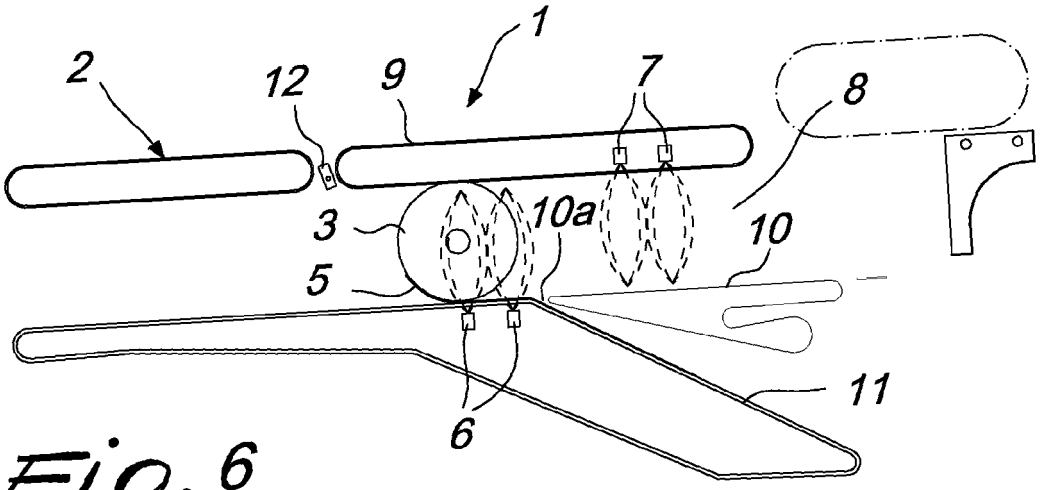

Fig. 6

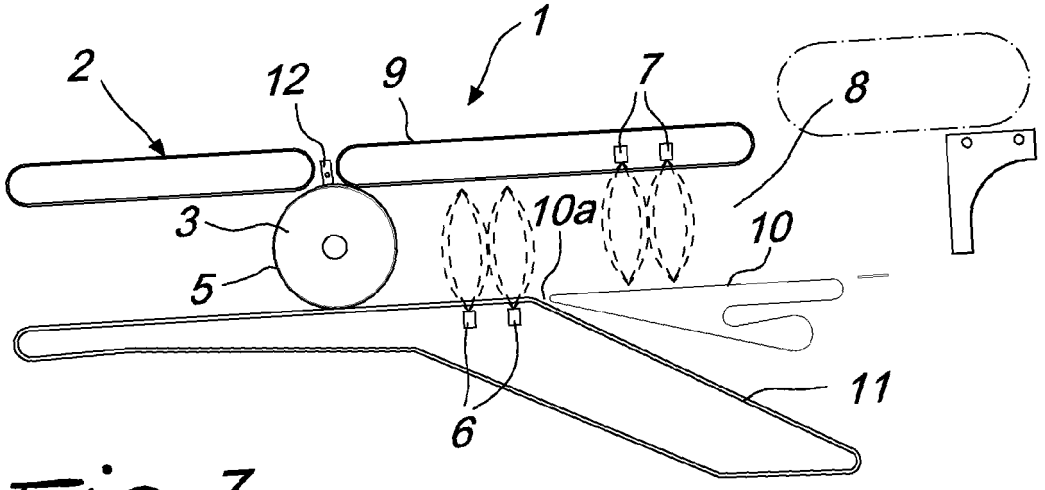

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 08 16 3185

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	GB 1 053 357 A (AB RESTELLO) 30 December 1966 (1966-12-30) * page 2, line 24 - page 3, line 41; figures * -----	1,12	INV. B65B11/04 B65B25/14
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A	GB 2 260 959 A (WRAPMATIC SPA [IT]) 5 May 1993 (1993-05-05) * claims; figures * -----	1,12	
			TECHNICAL FIELDS SEARCHED (IPC) B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 December 2008	Jagusiak, Antony

CATEGORY OF CITED DOCUMENTS

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09-12-2008

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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