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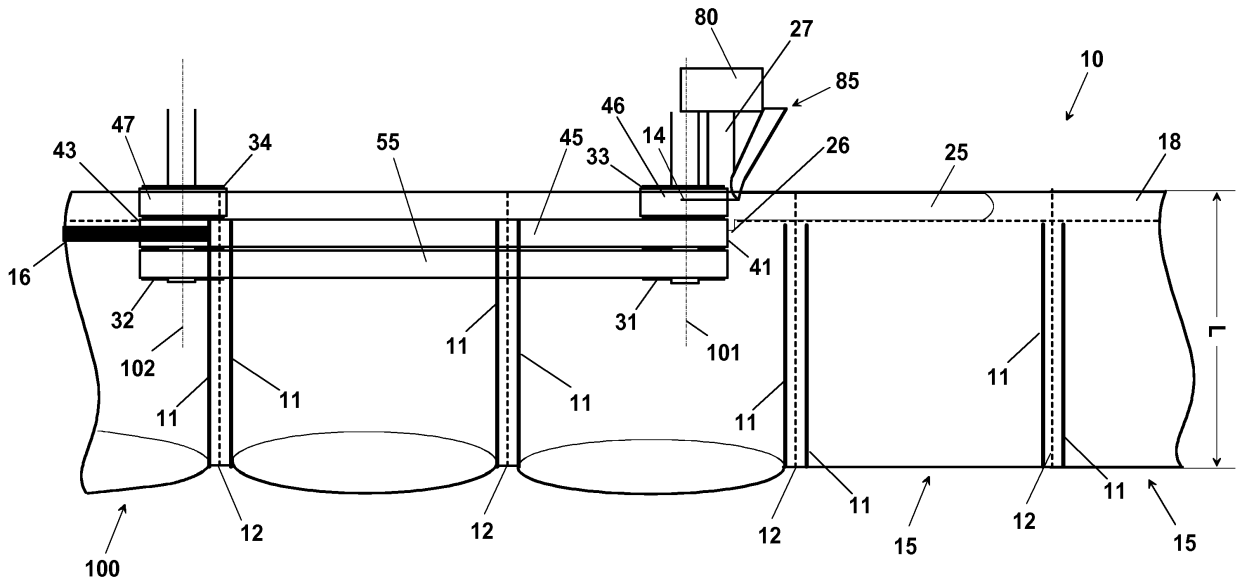
(54) **Machine for producing packaging material in the form of cushions filled with air or other gas**

(57) A machine (1) for making a packaging material in the form of cushions (100) of gas, for example cushions filled with air, comprises feeding rollers (21) that are adapted to bring a web (10) of thermoplastic material along a longitudinal feeding direction. The web (10) comprises, in particular two films (10a, 10b) that are overlapped to each other and can be unwound starting from a roll (50). The transversal welding lines (11) have in particular a length that is less than the transversal width (L) of the web (10), in order to define an open passageway (18) at which the web (10) is put on a longitudinal guide (25) that is arranged downstream of the feeding rollers (21). At the guide (25) a cutting blade (85) is present that cuts longitudinally the web (10) obtaining a longitudinal cut (14). This allows the introduction of an inflation member (27) and the movement of the web (10) along the machine (1).

Fig. 2



EP 2 143 555 A1

Description

Field of the invention

[0001] The present invention relates to the production of packaging material, in particular cushions that are inflated with air or other gas, and precisely it relates to a machine for making this packaging material.

[0002] Furthermore, the invention relates to a method for making such packaging material.

Description of the prior art

[0003] As well known, a common packaging material provides boards, or loose material having various shape, of polystyrene foam, polyurethane foams, antishock polystyrene, etc.

[0004] However, such packaging materials have the drawback of making the package heavy and of dirtying the product around. Therefore, a packaging material that protects the product avoiding at the same time the above described drawbacks is preferable such as antishock "cushions" of plastic film that are inflated to air, or other gas.

[0005] Such cushions, which are made usually of high density polyethylene, owing to its mechanical resistance that is remarkably higher than other plastic materials, can be made as a continuous strip of cushions that are arranged adjacent to each another, and can be used both for wrapping the products and for avoiding the movement into a container in which the product is housed for being transported.

[0006] A first kind of machines for making these cushions overlaps two films of high density polyethylene that are unwound from respective rolls and are conveyed towards heating elements, which are capable of melting locally the plastic material to make on it the welding lines.

[0007] More in detail, the films of plastic material are, firstly, welded along regularly distanced longitudinal lines, obtaining welding lines that are parallel to the direction of movement in order to define tubular chambers. During the movement the chambers are inflated with air and then are closed hermetically by transversal welding lines that along with the longitudinal lines define the cushions filled with air.

[0008] However, this type of machines has the need of stopping stepwise the web in order to make each transversal welding, with subsequent low production rate, which is justifiable only for wide cushioned webs with several rows of cushions.

[0009] Machines also exist to make a single row of cushions without stopping the web. These machines start from a web comprising two films of overlapped thermoplastic material and with transversal lines that have been made previously.

The machine blows air between the two films and by means of heating elements makes the longitudinal welding lines that with the transversal welding lines define the cushions filled with air. This way, the machine can operate continuously, i.e. without that the web is stopped stepwise.

[0010] In particular, the web provides transversal lines that have been made previously and are shorter than the width of the web, leaving thus an open passageway for inflating the cushions. This is obtained by introducing longitudinally an inflating tube, and by welding longitudinally the web by means of longitudinal heating elements after that each cushion has been inflated. The welding step is carried out on the inner side of the passageway, leaving out the inflating tube. The machine comprises, furthermore, a longitudinal conveying means for the web comprising a plurality of dragging rollers that are arranged along the heating elements. Furthermore, upstream of the inflating tube extends a longitudinal guide extends on which the web is put in order to engage the passageway. When the welding is made on the inner side of the passageway, the passageway same is cut on its outer side by a blade in order to let the guide and the tube to be freed and to release the web with the cushions formed in it.

[0011] However, such machines have some drawbacks. Firstly, in fact, the dragging rollers are arranged parallel to the longitudinal welding line opposite to the passageway. The dragging rollers arranged along the heating elements cause the web to shift at the heating elements with formation of creases and longitudinal welding lines that are not precise.

[0012] For this reason only a maximum limited speed can be achieved and then a low production rate.

[0013] In addition, the cutting blade is arranged at the heating elements. This would cause heating the blade same and then the possibility of melting that would damage the portion of web that is in contact with it. Furthermore, this solution is structurally complex for the vicinity of the blade and of the heating elements that requires long time for disassembling and assembling steps during maintenance.

[0014] Similarly, the air inflating tube extends up to the heating elements, with similar problems of heating the tube and of encumbrance of the tube, with complex maintenance steps.

Summary of the invention

[0015] It is therefore a feature of the present invention to provide a machine for making a packaging material in the form of cushions that are filled with air or other gas in order to achieve a high production rate.

[0016] It is also a feature of the invention to provide such a machine for assuring a correct positioning of the web in all the sections of the machine, in particular at the heating elements.

[0017] It is another feature of the invention to provide such a machine that is adapted to overcome the difficulties of the machines of the prior art.

[0018] These and other features are accomplished

with one exemplary machine, according to the invention, for making a packaging material, in particular cushions filled with air or other gas, comprising:

- a feeding means for feeding a web of thermoplastic material, said web having a first and a second overlapped films;
- an inflation means for inflating a gas between said films, said inflation means having a blowing portion that is arranged between said first and said second film;
- a heating means for heating said web in order to cause a local melting of said thermoplastic material along a longitudinal line;
- a conveying means that is adapted to convey said web of thermoplastic material along a longitudinal conveying direction, said conveying means adapted to work while said heating means causes said local heating;

wherein said conveying means comprises a first and a second dragging means that are arranged at opposite sides with respect to said longitudinal line and wherein the web is inflated by said inflation means on the side of said first dragging means.

[0019] Advantageously, furthermore, a longitudinal guide is provided. In particular, the web of thermoplastic material has the above described films that are firstly closed according to a tubular shape and then by transversal welding lines forming a plurality of chambers. More in detail, the transversal lines are shorter than a transversal width of the web of thermoplastic material in order to leave a passageway for introducing the guide, said longitudinal welding lines closing said chambers after blowing the gas in, and a means is provided for cutting said web of thermoplastic material in order to make a longitudinal cut to open longitudinally said passageway, to allow the inflation member to slide between said films and to allow the advance of the web with inflated and sealed chambers.

[0020] Advantageously, the first and the second dragging means comprises at least one roller.

[0021] Advantageously, the first and the second dragging means comprises a first and a second roller acting on a same longitudinal plane, in particular parallel to the longitudinal welding line.

[0022] In particular, the first and the second roller can be connected by a transmission belt that is adapted to cause the movement of the web of thermoplastic material along the conveying direction.

[0023] In particular, the first and the second dragging means can comprise a first part that is adapted to contact the first sheet and a second part that is adapted to contact the second sheet, wherein at least one of said parts is movable so that said parts can be relatively distant allowing the introduction of the web of thermoplastic material in a phase of starting the machine.

[0024] Advantageously, the heating means comprises a first longitudinal heater that is associated with the first part and a second longitudinal heater that is associated with the second part. Furthermore, a first and a second driven welding strips are provided that are adapted to move along with the web of thermoplastic material, and which slide on the respective first and second longitudinal heater in order to sandwich the web, said welding strips transmitting heat between the respective longitudinal heater and the web of thermoplastic material, and moving with the speed of the web of thermoplastic material, in order to avoid a direct sliding of the web of thermoplastic material with hot parts in order to cause a local melting of the thermoplastic material and to form the longitudinal welding line.

[0025] In particular, the cutting means cut longitudinally the tubular passageway of thermoplastic material out of the chambers to make a longitudinal cut, and a means is provided to prevent the air or gas from exiting through the longitudinal cut during the inflation step, wherein said means to prevent the air or gas from exiting are obtained by arranging said blowing portion between said second dragging means and said cutting means.

[0026] Advantageously, the cutting means is arranged upstream of the first and second dragging means.

[0027] In particular, between two consecutive chambers the web of thermoplastic material tear-off lines can be provided that assist the separation.

[0028] According to another aspect of the invention, a machine for making a packaging material, in particular cushions filled with air, comprises:

- a feeding means for feeding a web of thermoplastic material, said web having a first and a second overlapped films;
- an inflation means for inflating a gas between said films, said inflation means having a blowing portion that is arranged between said first and said second film;
- a heating means for heating said web in order to cause a local melting of said thermoplastic material along a longitudinal line;
- a conveying means that is adapted to convey said web of thermoplastic material along a longitudinal conveying direction, said conveying means adapted to work while said heating means causes said local heating;
- cutting means adapted to make a longitudinal cut on said web of thermoplastic material to let said inflation member enter between the two sheets and to allow the movement of the web;

  whose main feature is that said cutting means is arranged upstream of said dragging means.

[0029] This overcomes the difficulties presented by the similar machines of the prior art where the cutting means is arranged at the heating means. The structure of the machines of the prior art, in fact, causes a superheating of the cutting means with subsequent possible damage

of the portion of web that is in contact with it. Furthermore, that structure is complex for the vicinity of the cutting means and of the heating means and requires long time for maintenance.

Brief description of the drawings

[0030] The invention will be now shown with the following description of an exemplary embodiment thereof, exemplifying but not limitative, with reference to the attached drawings wherein:

- figure 1 diagrammatically shows an elevational side view of a machine for making cushions filled with air, or other gas, for packaging purposes, according to the invention;
- figure 2 diagrammatically shows a top plan view of the machine of Fig. 1 for highlighting the layout of the main parts and, in particular, their position with respect to the web;
- figure 3 diagrammatically shows a top plan view of an exemplary embodiment of the machine of Fig. 2;
- figure 4 shows a perspective view of the machine of Fig. 1 for highlighting the operation of the main mechanical parts;
- figure 5 shows a perspective view of the machine of Fig. 1 in operative conditions;
- figures 6 and 7 show in detail perspective side elevational views of the first and the second plurality of rollers of the machine of Fig. 1.

Description of the preferred exemplary embodiment

[0031] With reference to Fig. 1, a machine 1 for making a packaging material in the form of cushions 100 filled with gas, according to the invention, for example cushions filled with air, comprises feeding rollers 21 that are adapted to bring a web 10 of thermoplastic material along a longitudinal direction of movement indicated in the figure by an arrow. Web 10 comprises, in particular two films 10a and 10b that are overlapped to each other and can be unwound starting from a roll 50.

[0032] Web 10 comprises a plurality of transversal chambers 15 that are insulated pneumatically from each other by means of transversal welding lines 11 that extend for all the width of web 10 and that are perforated to assist the separation of a cushion 100 from the growing web. A tear-off line 12 is made between each two transversal welding lines 11 along which the overlapped films 10a and 10b are connected in order to provide a plurality of tubular chambers. The transversal welding lines 11 have in particular a length that is less than the transversal width L of web 10, in order to define an open passageway 18 (Fig. 2).

[0033] More in detail, when starting the machine 1, passageway 18 of web 10 is put on a longitudinal guide 25 that is arranged downstream of feeding rollers 21. In an exemplary embodiment shown in the figures, guide 25 comprises a blowing portion 27 that is equipped with a hole 26 through which a measured amount of gas, for example air, is put into each chamber 15. The hole 26 is in pneumatic connection with a source of a gas, for example a fan 80, through inflation member 27.

[0034] At guide 25 a cutting blade is present 85 that cuts longitudinally web 10 obtaining a longitudinal cut 14. This allows the introduction of inflation member 27 and the movement of web 10 along machine 1.

[0035] Downstream of the cutting blade 85 a first series is provided of dragging rollers 31a-35a that are arranged on one side of web 10 and a second plurality of dragging rollers 31b-35b that are arranged opposite to the first series of rollers 31a-35a with respect to web 10. In particular, dragging rollers 31-35 are adapted to transfer web 10 by guide 25, firstly, to welding means 130a and 130b and then to an exit section 90 of cushions 100.

[0036] In particular, once the air has been blown in chamber 15, the latter is closed hermetically by welding means 130a and 130b that make on it a longitudinal welding line 16. Therefore at the exit of the machine 1 an inflated cushion 100 is defined by two transversal welding lines 12 and by longitudinal welding line 16.

[0037] Welding means 130a and 130b can comprise, for example, a welding strip 45a and 45b, for example made of Teflon® that is movable on guide rollers 41a-43a and 41b-43b, respectively. Each welding strip 45a, or 45b, is arranged in contact with a respective heating plate 56a, or 56b (Figs. 6 and 7) that transmits the heat necessary for melting locally web 10 in order to provide longitudinal welding line 16 that closes chamber 15.

[0038] Heating plates 56a and 56b are moved by an actuator, not shown in the figures, towards/away from web 10 to assist the steps of arranging the web at the startup of the machine, for changing strips 50 and for carrying out other maintenance steps.

[0039] According to the invention, on one side of each welding strip 45a and 45b dragging rollers 33a and 33b are provided, respectively, that counter rotates with respect to each other and are adapted to bring web 10 towards welding means 130a and 130b. In particular, dragging rollers 33a and 33b are peripherally coated with a layer 46 of flexible material. Therefore, in operative conditions, dragging rollers 33a and 33b in addition to convey web 10 keep the two wings of the longitudinal cut tightly close, in order to prevent air exiting from chamber 15 that is being formed. In particular, the action of the dragging rollers causes an adhesion of web 10 to inflation member 27 at keep longitudinal cut 14 close avoiding the outlet of gas.

[0040] Coaxially to dragging rollers 33a and 33b, but opposite to them with respect to guide rollers 41a and 41b, idle rollers 31a and 31b are provided, respectively, that are connected by transmission belts 55a and 55b to respective driven rollers 32a and 32b. This way, rollers 33a, 31a and 41a are wheeled about axis 101a and rollers 33b, 31b and 41b are wheeled about axis 101b.

[0041] The transmission belts 55a and 55b act also

from belts for dragging web 10.

[0042] At the other end of welding means 130a and 130b dragging rollers 34a and 34b are provided, which are capable of rotating about respective axes 102a and 102b for dragging inflated and sealed cushions 100 away from the machine 1. Dragging rollers 34a and 34b can be coated peripherally by a layer of flexible material 47a and 47b respectively.

[0043] This way, a dragging path of web 10 is obtained that ensures a correct conveyance when entering between welding means 130a and 130b, through them and then at the exit from machine 1. In particular, differently from the prior art machines the presence of the double dragging means avoids the production of a couple of forces and ensures a regular movement of the web through the machine.

[0044] As shown in detail in Fig. 6, dragging roller 34a is mounted on the same axis of rollers 42a and 32a and is connected by a transmission belt 47a to a roller 35a. This is mounted coaxially to a roller 43a that is wheeled about axis 103a to operate roller 35a. Rollers 41a-43a form the path for guiding welding strip 45a.

[0045] With reference to Fig. 7, dragging rollers 31b-35b and the guide rollers 41b-43b are wheeled about the respective axes by a motor 200 that is connected to the shaft 210 of rollers 32b, 42b and 34b by a transmission belt 205. On the transmission shaft 210, furthermore, a gear 201 is mounted that is inserted on a gear 202 integral to shaft 215 of rollers 34a, 42a and 32a.

[0046] The structure above described and shown in Figs. allows operating the transmission rollers and the guide rollers with a single motor. In an alternative solution, not shown in the figures, it is possible to use more motors for operating independently the different groups of rollers.

[0047] The foregoing description of a specific embodiment will so fully reveal the invention according to the conceptual point of view, so that others, by applying current knowledge, will be able to modify and/or adapt for various applications such an embodiment without further research and without parting from the invention, and it is therefore to be understood that such adaptations and modifications will have to be considered as equivalent to the specific embodiment. The means and the materials to realise the different functions described herein could have a different nature without, for this reason, departing from the field of the invention. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Claims

1. Machine for making a packaging material, in particular cushions filled with air, comprising:

- a feeding means for feeding a web of thermoplastic material, said web having a first and a second overlapped films;
- an inflation means for inflating a gas between said films, said inflation means having a blowing portion that is arranged between said first and said second film;
- a heating means for heating said web in order to cause a local melting of said thermoplastic material along a longitudinal line;
- a conveying means that is adapted to convey said web of thermoplastic material along a longitudinal conveying direction, said conveying means adapted to work while said heating means causes said local heating;

characterised in that said conveying means comprises a first and a second dragging means that are arranged at opposite sides with respect to said longitudinal line; **and in that**
said inflation means is arranged such that said web of thermoplastic material is inflated on the side of said first dragging means.

2. Machine for making a packaging material, according to claim 1, comprising a longitudinal guide, said web having said films closed according to a tubular shape and having also transversal welding lines that form a plurality of chambers, wherein said transversal lines are shorter than a transversal width of said web of thermoplastic material in order to leave a passageway for introducing said guide, said longitudinal welding lines closing said chambers after being inflated by blowing said gas and a means is provided for cutting said web in order to make a longitudinal cut to open longitudinally said passageway, to allow the inflation member to slide between said films and to allow the advance of the web with inflated and sealed chambers.

3. Machine for making a packaging material, according to claim 1, wherein said first and said second dragging means comprises at least one roller.

4. Machine for making a packaging material, according to claim 1, wherein said first and said second dragging means comprises a first and a second roller acting on a same longitudinal plane.

5. Machine for making a packaging material, according to claim 1, wherein said first and second roller are connected by a transmission belt that is adapted to cause the movement of said web along said conveying direction.

6. Machine for making a packaging material, according to claim 1, wherein said first and said second dragging means comprises a first part that is adapted to contact said first sheet and a second part that is adapted to contact said second sheet, wherein at

least one of said parts is movable so that said parts can be relatively distant allowing the introduction of the web of thermoplastic material in a phase of starting the machine.

7. Machine for making a packaging material, according to claim 1, wherein said first and second dragging means comprises a first part that is adapted to contact said first sheet and a second part that is adapted to contact said second sheet, and wherein said heating means comprises a first longitudinal heater that is associated with said first part and a second longitudinal heater that is associated with said second part, and a first and a second driven welding strips are provided that are adapted to move along with the web of thermoplastic material, and which slide on the respective first and second longitudinal heater in order to sandwich the web, said welding strips transmitting heat between the respective longitudinal heater and the web of thermoplastic material, and moving with the speed of the web of thermoplastic material, in order to avoid a direct sliding of the web of thermoplastic material with hot parts in order to cause a local melting of the thermoplastic material and to form the longitudinal welding line.

8. Machine for making a packaging material, according to claim 1, wherein a means is provided for cutting longitudinally said tubular web of thermoplastic material out of said chambers in order to make a longitudinal cut, and a means is provided to prevent the air or gas from exiting through said longitudinal cut when blowing said gas in, wherein said means to prevent the air or gas from exiting are obtained by arranging said blowing portion in contact between said second dragging means and said cutting means.

9. Machine for making a packaging material, according to claim 2, or 8, wherein said cutting means is arranged upstream of said dragging means.

10. Machine for making a packaging material, in particular cushions filled with air, comprising:

- a feeding means for feeding a web of thermoplastic material, said web having a first and a second overlapped films;
- an inflation means for inflating a gas between said films, said inflation means having a blowing portion that is arranged between said first and said second film;
- a heating means for heating said web in order to cause a local melting of said thermoplastic material along a longitudinal line;
- a conveying means that is adapted to convey said web of thermoplastic material along a longitudinal conveying direction, said conveying means adapted to work while said heating means causes said local heating;
- cutting means adapted to make a longitudinal cut on said web of thermoplastic material to let said inflation member enter between the two sheets and to allow the movement of said web;

characterised in that said cutting means is arranged upstream of said dragging means.

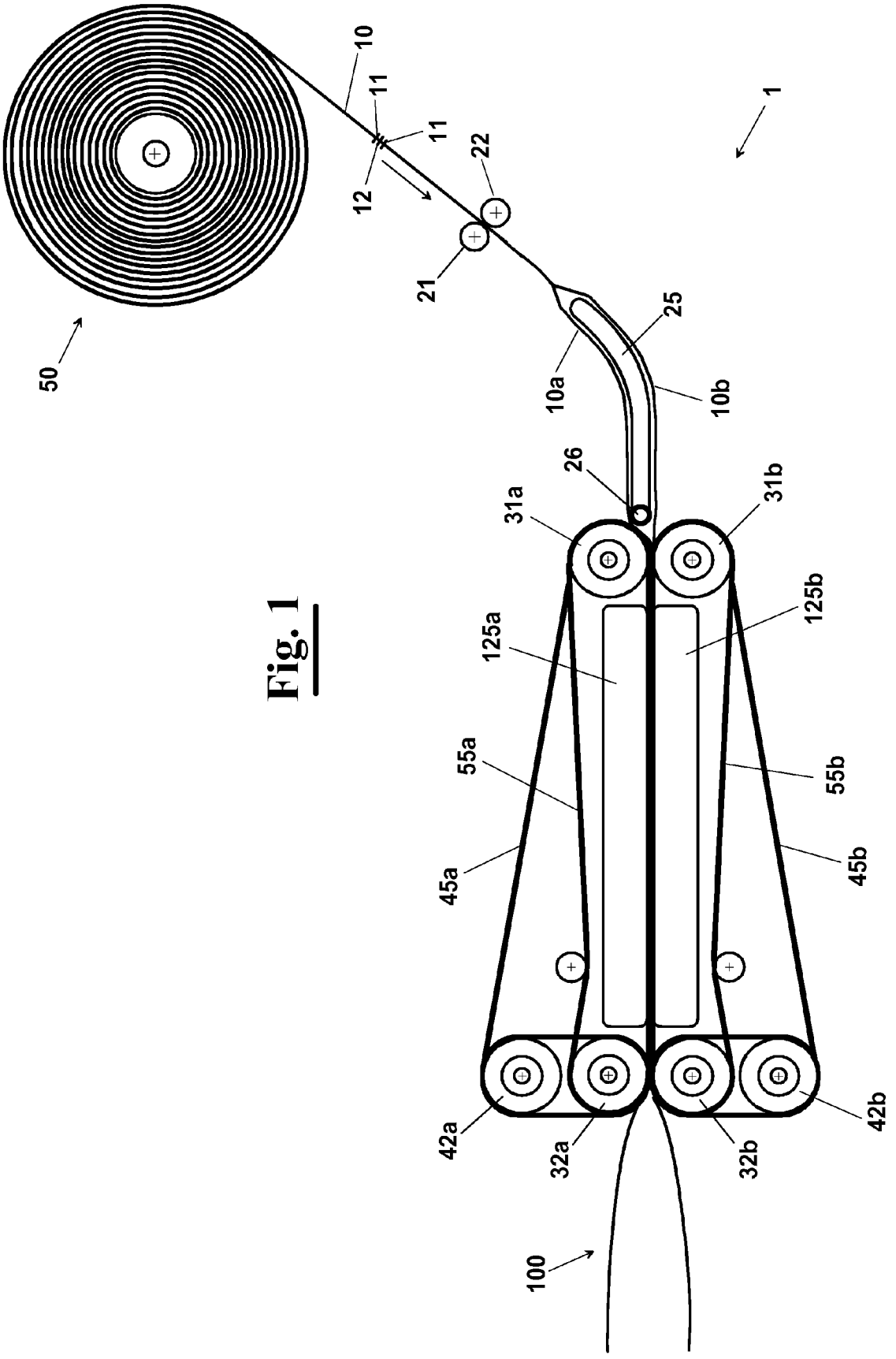

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Fig. 1

Fig. 2

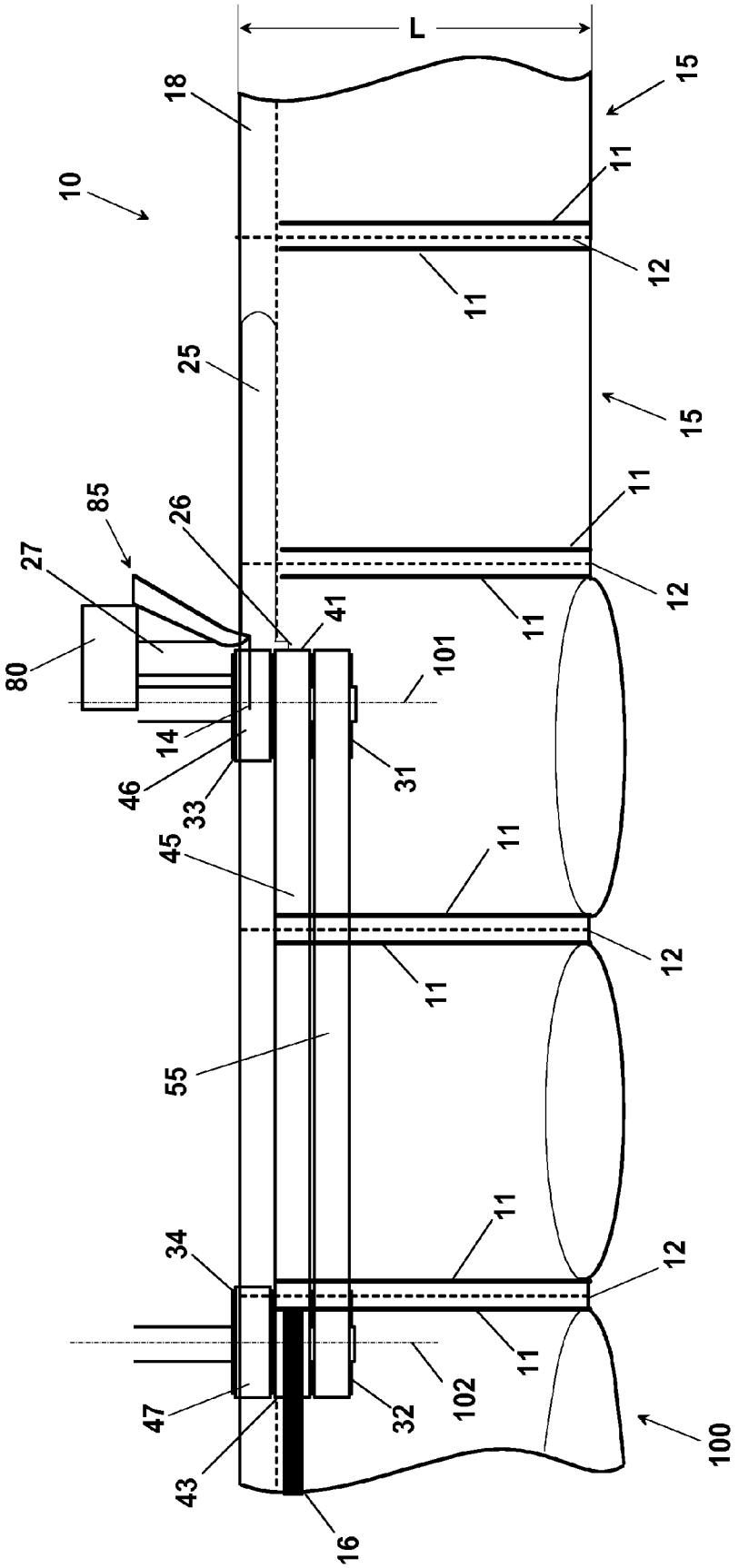
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Fig. 3

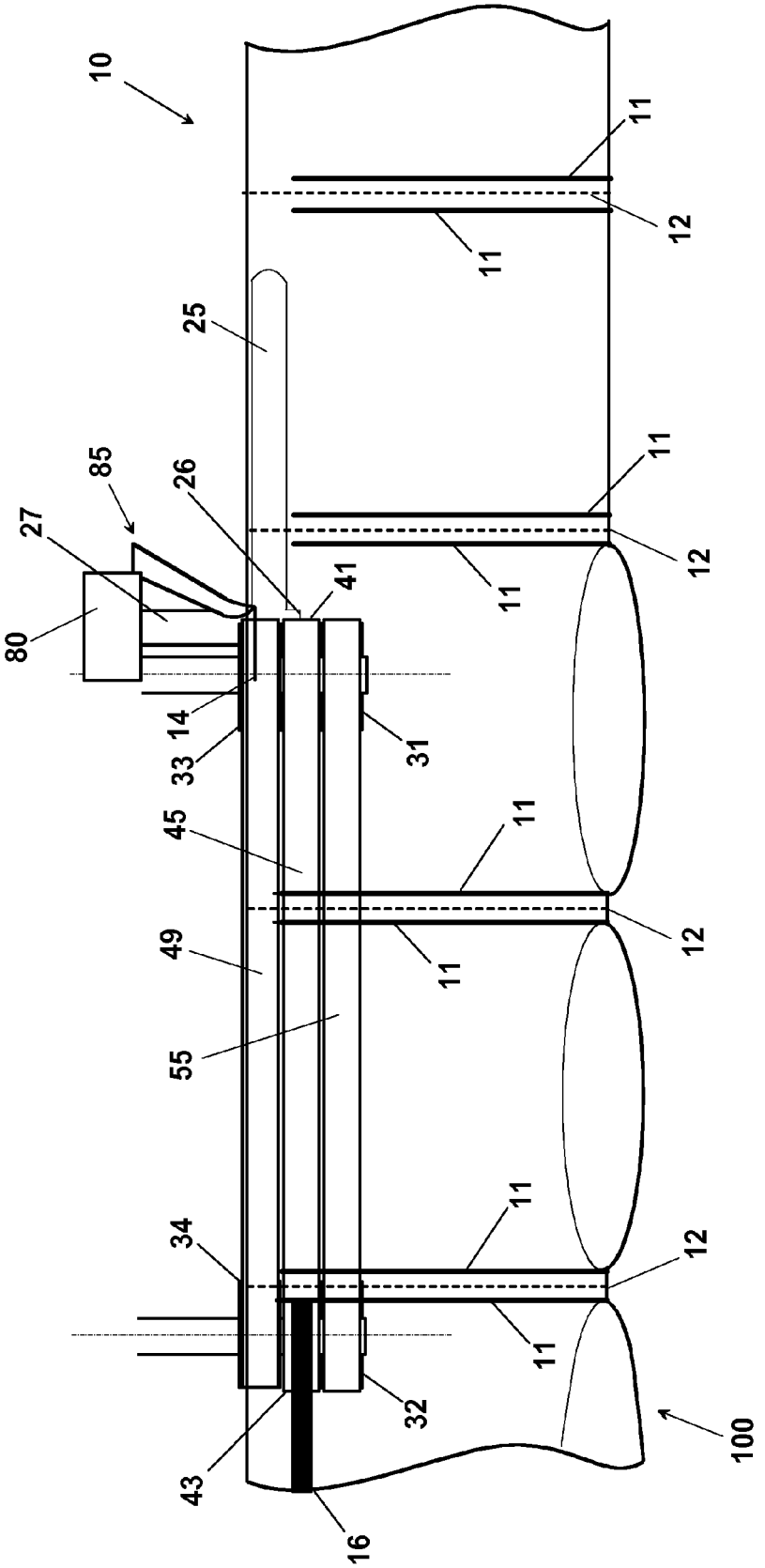

Fig. 4

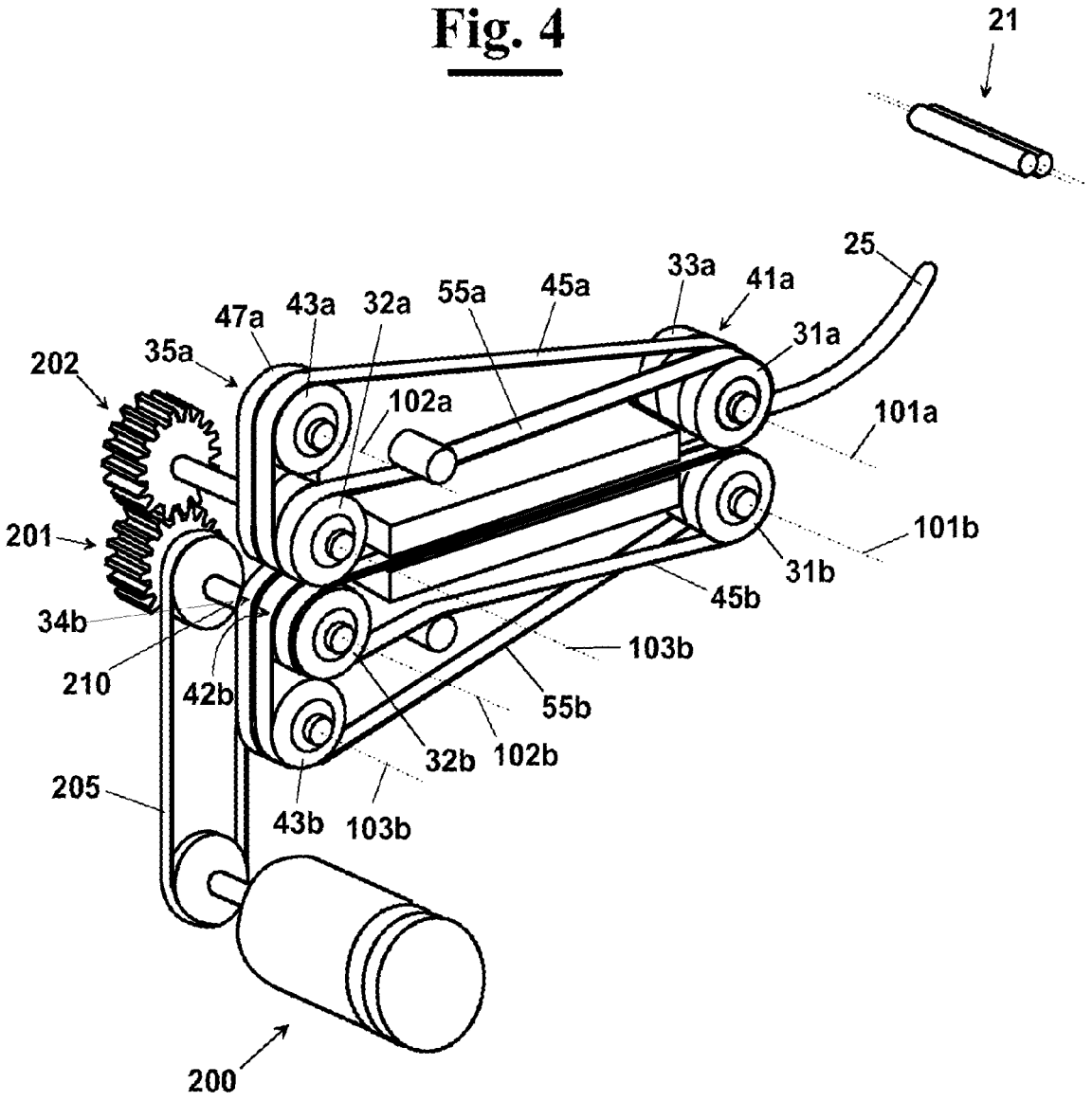
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Fig. 5

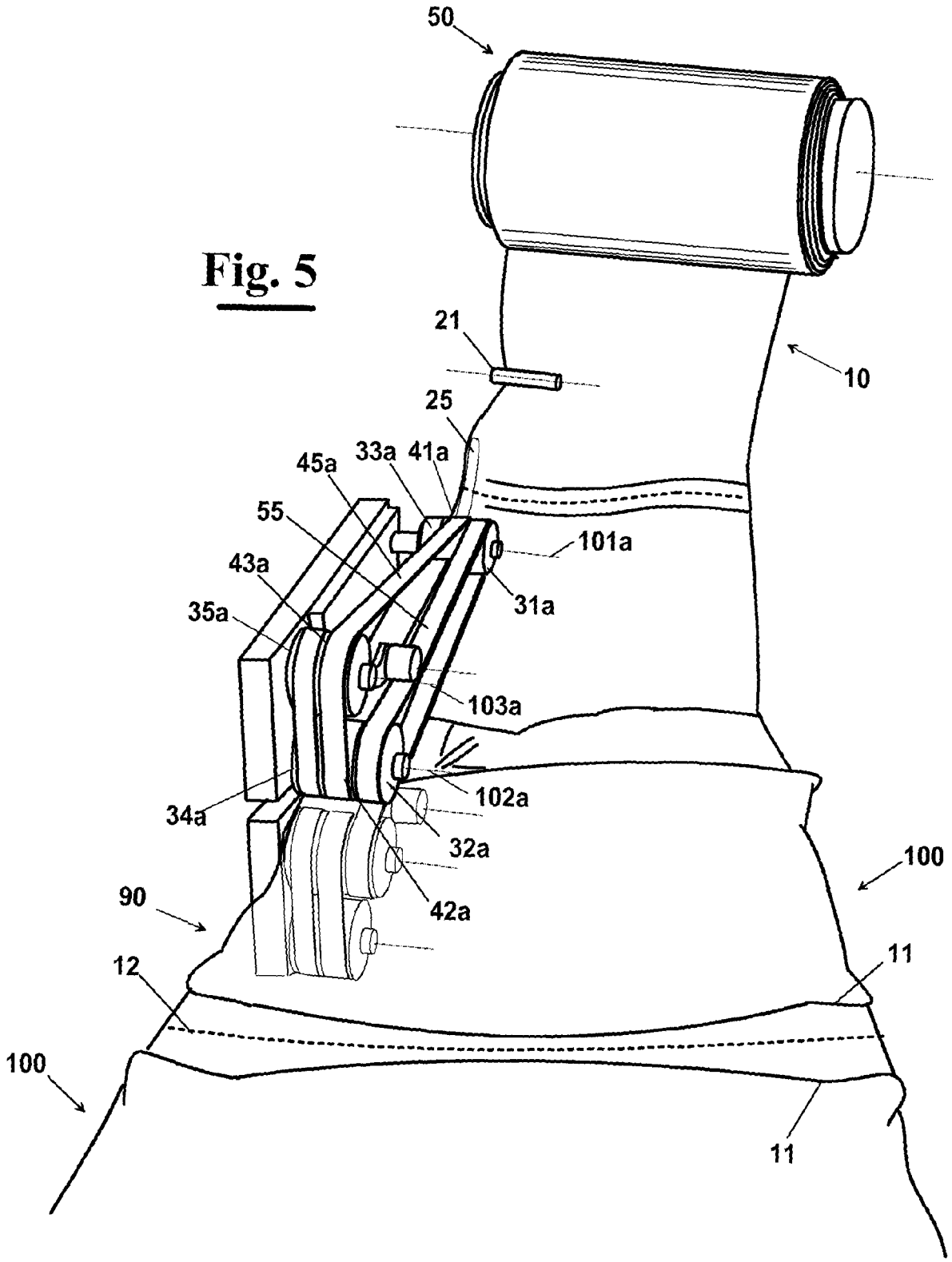
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Fig. 6

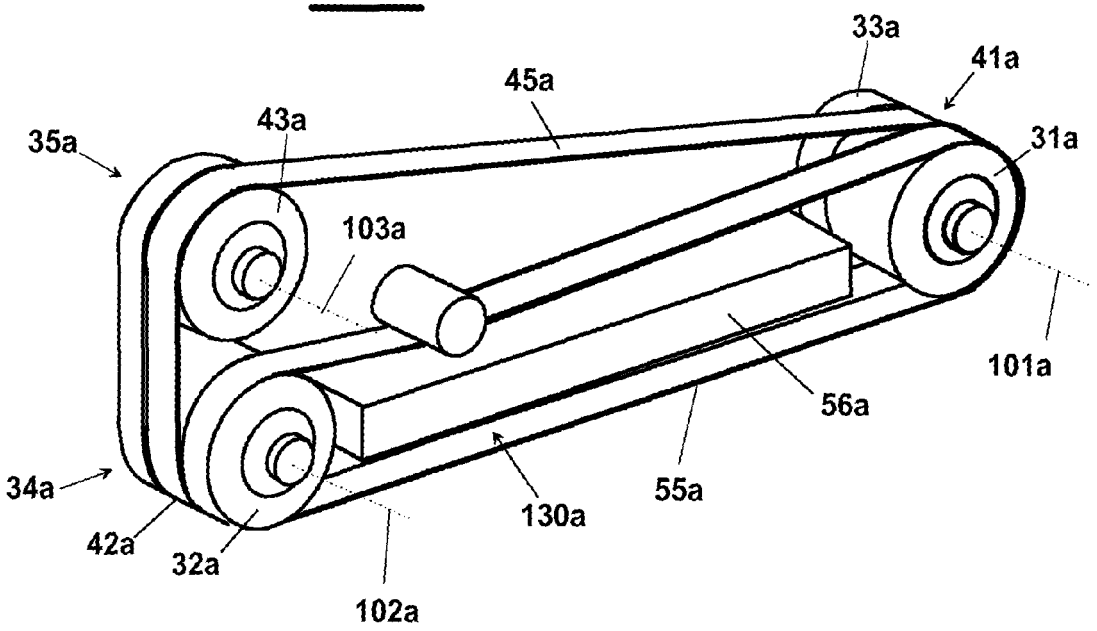
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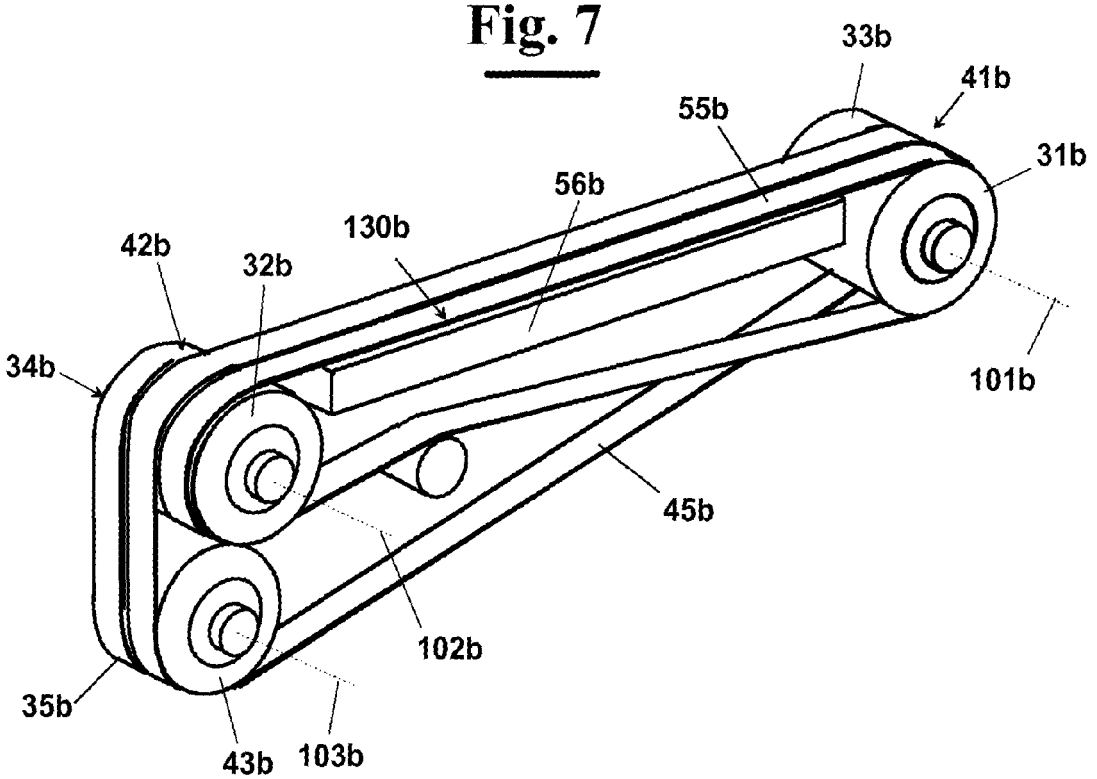
Fig. 7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EUROPEAN SEARCH REPORT

Application Number
EP 08 17 0033

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	WO 00/53501 A (NOVUS PACKAGING CORP [US]) 14 September 2000 (2000-09-14) * page 7, line 21 - page 10, line 34; figures 4,7 *	1	INV. B31D5/00
A	WO 94/07678 A (KLERK S PLASTIC IND B V [NL]; SCHRAM HENK [NL]) 14 April 1994 (1994-04-14) * page 5, line 16 - page 7, line 7; figures 3-6 *	1 9	
A	GB 2 257 087 A (KABUSHIKIKAISHA KASHIHARASEITA [JP]) 6 January 1993 (1993-01-06) * abstract *	1,2,9	

TECHNICAL FIELDS SEARCHED (IPC)

B31D

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	7 May 2009	Farizon, Pascal

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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Application Number
EP 08 17 0033

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-9

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 08 17 0033

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-9

blowing means on the side of the first conveying means
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2. claim: 10

cutting means arranged upstream of the conveying means

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 17 0033

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