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Remarks:
Amended claims in accordance with Rule 137(2) EPC.

(54) Vacuum packing machine and method of its operation

(57) The present invention relates to a vacuum packing machine for packaging and compressing a roll of compressible material, such as insulation material, wherein said machine comprises
- means for compressing said roll to a compressed state by adding vacuum to said roll and
- means for fixating said roll in a compressed state by adding fixation foil around said compressed roll
wherein said means for compressing and fixating the roll comprise
- means for suspending and tightening said fixation foil around said roll during compression and
- means for welding said tightened fixation foil when said roll has reached its compressed state.

Thereby compressed rolls having only two layers of foil are obtained. Furthermore, the packaging is fully automated, ensuring more uniform packed rolls and a more efficient packaging process. Furthermore, the final products end up having a smaller size, which is an advantage when handling and transporting the rolls. When using the insulation material in the rolls, only two layers of foils have to be unpacked.

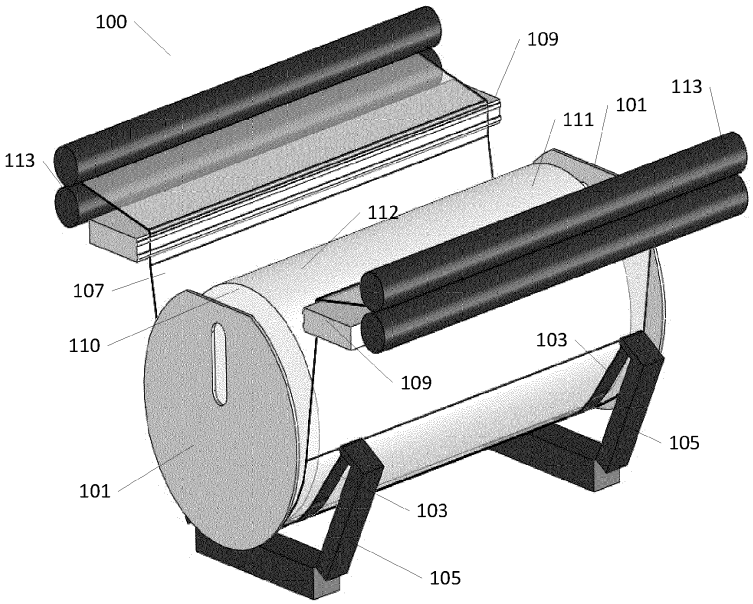

Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to a machine and a method of packing and compressing a roll of compressible material, such as insulation material.

Background of the Invention

[0002] When packaging insulating material, the packaging can be done by first rolling strips of insulating material, whereafter the roll is compressed and fixed by adding a first layer of fixation foil around the rolled flexible material. In order to save space when further handling the roll of insulating material, the roll with the first layer of foil is inserted in an airtight bag, and air is sucked out of the bag to further decrease the size of the roll. In order to keep the decreased size, a second layer of fixation foil is fixed around the decreased roll in the package.

[0003] Problems with this method is that it is a quite cumbersome and time-consuming process, and furthermore the final package ends up having three layers of foil (two fixation layers and a bag), which is expensive and disposal is harmful to the environment.

Object of the Invention

[0004] It is an object of the present invention to solve the abovementioned problems.

Description of the Invention

[0005] This is obtained by a vacuum packing machine for packaging and compressing a roll of compressible material, such as insulation material wherein said machine comprises

- means for compressing said roll to a compressed state by adding vacuum to said roll and
- means for fixating said roll in a compressed state by adding fixation foil around said compressed roll

wherein the means for compressing and fixating the roll comprise

- means for suspending and tightening said fixation foil around said roll during compression and
- means for welding said tightened fixation foil when said roll has reached its compressed state.

[0006] Thereby compressed rolls having only two layers of foil are obtained. Furthermore, the packaging is fully automated ensuring more uniform packed rolls and a more efficient packaging process. Furthermore, the final products end up having a smaller size, which is an advantage when handling and transporting the rolls. When using the insulation material in the rolls, only two layers of foils have to be unpacked.

[0007] In an embodiment said means for suspending and tightening said fixation foil, are two foil feeding cylinders, where said fixation foil is suspended between said pair of foil feeding cylinders and tightened by rotating said foil feeding cylinders in opposite directions.

[0008] By having foil feeding cylinders it is possible to control the amount of foil being added around the compressed roll and thereby it can be ensured that each compressed roll has the same roll circumference. Thereby identical packages are obtained making it easier when packaging them for storage or transport

[0009] In an embodiment said means for welding are welding and cutting pieces, wherein said pieces comprise means for welding in two positions and for cutting said foil between said two positions.

[0010] Thereby a continuous piece of foil is maintained in the machine and immediately after packaging a first roll a new roll can enter the machine.

[0011] In an embodiment said welding and cutting pieces are bars comprising two welding strips in mutual distance and cutting means between said strips.

[0012] In an embodiment said means for compressing said roll are vacuum suction ends positioned against each end of the roll sucking air out of the roll.

[0013] Thereby the suction end points can be pushed towards the ends of the roll, and vacuum can be generated in the roll, thereby compressing the roll.

[0014] In an embodiment the machine comprises support means for lifting the ends of said roll during compression.

[0015] Thereby the compression is uniform throughout the length of the roll. This also ensures a specific and uniform circumference of the compressed rolls.

[0016] In an embodiment said support means are support belts mounted on a support structure for supporting said roll while being compressed, and wherein said support belts are adapted for being tightened for lifting said roll during compression.

[0017] Thereby the belts are flexible towards the roll minimizing the risk of damaging the rolls during compression.

[0018] The invention furthermore relates to a method for packaging and compressing a roll of compressible material, such as insulation material, wherein said method comprises

- compressing said roll to a compressed state by adding vacuum to said roll and
- fixating said roll in a compressed state by adding fixation foil around said compressed roll,

wherein the step of compressing and fixating the roll comprises the steps of

- suspending and tightening said fixation foil around said roll during compression and
- welding said tightened fixation foil when said roll has

reached its compressed state.

[0019] In an embodiment said method of compressing and fixating the roll furthermore comprises the step of relaxing and tightening said fixation foil after suspending and tightening during compression and before welding.

[0020] In an embodiment said step of compressing and fixating the roll furthermore comprises the steps of lifting the ends of said roll during compression.

Description of the Drawing

[0021] In the following, the invention will be explained in more details with reference to the accompanying drawing, in which:-

Fig. 1 shows an embodiment of a vacuum packing machine according to the present invention,

Fig. 2 shows a detailed view of the suction ends,

Fig. 3 shows a detailed view of the welding pieces,

Fig. 4 shows in steps A-H a method according to the invention for packaging a roll of insulating material.

Detailed Description of the Invention

[0022] Fig. 1 shows a roll vacuum packing machine 100 according to the present invention, the machine comprises vacuum suction ends 101, carrier bands 103, a support structure 105, foil feeding cylinders 113 and welding and cutting pieces 109. The machine can compress an already wrapped roll of flexible material 111 into a smaller roll by compressing and wrapping the roll into another layer of packaging foil 107. The vacuum packing machine is typically part of a larger structure and could e.g. be integrated as part of a more complex insulation material processing/packaging system.

[0023] The vacuum suction ends 101 are provided with holes (not shown) attached to a negative pressure of air (not shown), whereby each end can suck air out of a roll positioned between the suction ends 101.

[0024] The roll 111 to be further processed is already wrapped in airtight foil 112, and the vacuum suction ends are pushed towards the ends of the roll 111 whereafter a negative pressure is applied by sucking air out of the roll from each end.

[0025] In an alternative embodiment one end could be a passive plate blocking air from entering the roll, thereby when sucking air from the vacuum suction end at the other end, the roll 111 is compressed.

[0026] When sucking air out of the roll the size of the roll 111 decreases. Each end of the roll rests on a support belt. Besides from supporting the roll, the belt is tightened during compression thereby ensuring a more linear compression of the roll, otherwise the ends might be compressed less than the middle part of the roll, due to friction between the suction plates.

[0027] While compressing the roll 111, the roll is positioned on the fixation foil 107. Welding and cutting pieces 109 are positioned above the roll 111, and before compression is initiated these welding and cutting pieces 109 are moved together to ensure fixation foil around the complete circumference of the roll 111. When the roll 111 is compressed, the fixation foil 107 is welded by the welding and cutting pieces 109 thereby fixating the roll 111 in the compressed state.

[0028] The welding and cutting pieces 109 weld by melting the two layers of fixation foil together, thereby the foil is also cut from the remaining foil.

[0029] Furthermore, foil feeding cylinders 113 ensure that the packaging foil is tightly suspended around the roll 111, and during compression the fixation foil 107 is tightened around the roll 111 as the diameter of the roll 111 decreases.

[0030] The feeding cylinders 113 could e.g. be driven by a servo motor, but they could also be controlled by an encoder. The rotation can thereby be controlled and thereby the amount of foil being fed is controlled to ensure a uniform circumference of the compressed and wrapped rolls 111.

[0031] Fig. 2 shows a detailed view of the suction ends 101. The two suction ends are similar and comprise a suction hole 201 connected to a suction channel 203 through which a negative pressure is applied. The suction ends are mounted on a track system 205 for sliding the suction ends 101 back and forth to enable close contact with the ends of the roll.

[0032] Fig. 3 shows a detailed view of the welding and cutting pieces 109 seen from the side. It comprises a first welding piece 301 and a second welding piece 303 positioned opposite each other. The first welding piece 301 comprises first outer fixation arms 305 interacting with opposite second outer fixation arms 307 on the second welding piece for fixating the foil 107. The first outer fixation arms 305 have an uneven end surface 310 interacting with a soft end surface 311 on the second outer fixation arms 307, thereby obtaining fixation of the foil 107 for subsequent welding and cutting between the two sets of outer fixation arms 305, 307. The second outer fixation arms furthermore comprise springs 309, thereby further enhancing the fixation of the foil 107. For welding and cutting welding arms, cutting means are positioned between the fixation arms. The welding arms 313 melt and weld the foil in two positions e.g. by a welding wire, and cutting means 315 cut the foil between these two positions.

[0033] Fig. 4 illustrates in steps A-G a method of compression packaging a roll of insulating material according to the present invention.

[0034] Figure 4A illustrates in respectively an isometric view (left) and in an end view (right) how a roll 111 is positioned on top of fixation foil 107 stretched between the foil feeding cylinders 113. The welding and cutting pieces 109 are moved apart from each other whereby

the roll 111 can fall down between the welding and cutting pieces 109.

[0035] Figure 4B illustrates in respectively an isometric view (left) and in an end view (right) that the roll 111 has moved down between the welding and cutting pieces 109 and that each end of the roll 111 rests on the support belts 103. The foil feeding cylinders 113 relaxes the fixation foil 107 by directing the fixation foil to follow the roll 111 down to the support belt 103 and furthermore they ensure that the fixation foil 107 is tight. By controlling the direction of rotation of each feeding cylinder, it is possible to control in which direction the foil is directed.

[0036] Figure 4C illustrates in respectively an isometric view (left) and in an end view (right) that the welding and cutting pieces 109 have been moved together after the roll 111 has entered between the welding and cutting pieces 109, and that they are supported by the support belts 103. A small gap is maintained between the welding and cutting pieces 109 allowing the fixation foil to move between the welding pieces.

[0037] Figure 4D illustrates in respectively an isometric view (left) and in an end view (right) that the vacuum suction ends 101 have been moved towards the ends of the roll 111 and that vacuum is applied to the roll by sucking air from the roll 111 via each vacuum suction end 101. Furthermore, when vacuum is applied the fixation foil 107 is kept tight around the roll 111 by using the feeding cylinders for withdrawing the foil 107.

[0038] Figure 4E illustrates in respectively an isometric view (left) and in an end view (right) that the size of the roll decreases while air is being sucked out of the roll 111. While the size increases, the fixation foil 107 is kept tight around the roll 111 using the foil feeding cylinders 113. Furthermore, the support belts 103 lift the end pieces of the roll 111 ensuring that the end pieces of the roll 111 are being moved to follow the size of the central part of the roll 111

[0039] In an embodiment the machine comprises sensors for detecting how hard the feeding cylinders pull the foil; thereby the speed of rotation of the cylinders can be stopped in case the feeding cylinders pull too hard. Thereby increase of roll circumference and withdrawing of foil can be synchronized.

[0040] Figure 4F and 4G illustrate in respectively an isometric view (left) and in an end view (right) that the welding and cutting pieces 109 are moved away from each other and back together again, this is done to ensure that folds in the fixation foil 107 generated during the compression are removed. Finally, the foil is welded and cut using the welding and cutting pieces 109. While the welding and cutting pieces 109 are being moved away from each other again and back together again, vacuum is maintained to ensure that the compressed roll does not expand during the process.

[0041] After compression and after the foil has been welded and cut, vacuum is stopped enabling the compressed roll to leave the machine.

[0042] Figure 4H illustrates in respectively an isometric view (left) and in an end view (right) how the compressed roll 115 leaves the apparatus. The fixation foil in the machine has been welded and is ready to receive the next roll to be compressed and fixated in compressed state by the foil.

Reference numbers

[0043]

100 - Roll vacuum packing machine

101 - Vacuum suction end

103 - Support belt

105 - Support structure

107 - Fixation foil

109 - Welding and cutting piece

111 - Roll of flexible material 110, wrapped in foil 112

113 - Pair of foil feeding cylinders

115 - Compressed roll wrapped in fixation foil 107

201 - Suction hole

203 - Suction channel

205 - Track system

301 - First welding piece

303 - Second welding piece

305 - First outer fixation arms

307 - Second outer fixation arms

309 - Springs

311 - Soft end surface

313 - Welding arms

315 - Cutting means

Claims

1. A vacuum packing machine for packaging and compressing a roll of compressible material, such as insulation material, wherein said machine comprises

- means for compressing said roll to a com-

pressed state by adding vacuum to said roll and
- means for fixating said roll in a compressed state by adding fixation foil around said compressed roll

characterised in, that said means for compressing and fixating the roll comprises

- means for suspending and tightening said fixation foil around said roll during compression and
- means for welding said tightened fixation foil when said roll has reached its compressed state.

2. A machine according to claim 1, wherein said means for suspending and tightening said fixation foil are two foil feeding cylinders, where said fixation foil is suspended between said pair of foil feeding cylinders and tightened by rotating said foil feeding cylinders in opposite directions.

3. A machine according to claim 1-2, wherein said means for welding are welding and cutting pieces wherein said pieces comprise means for welding in two positions and for cutting said foil between said two positions.

4. A machine according to claim 3, wherein said welding and cutting pieces are bars comprising two welding strips in mutual distance and cutting means between said strips.

5. A machine according to claim 1-4, wherein said means for compressing said roll are vacuum suction ends positioned against each end of the roll sucking air out of the roll.

6. A machine according to claim 1-5, wherein the machine comprises support means for lifting the ends of said roll during compression.

7. A machine according to claim 6, wherein said support means are support belts mounted on a support structure for supporting said roll while being compressed, and wherein said support belts are adapted for being tightened for lifting said roll during compression.

8. A method for packaging and compressing a roll of compressible material, such as insulation material, wherein said method comprises

- compressing said roll to a compressed state by adding vacuum to said roll and
- fixating said roll in a compressed state by adding fixation foil around said compressed roll

characterised in, that said step of compressing and fixating the roll comprises the steps of

- suspending and tightening said fixation foil around said roll during compression and
- welding said tightened fixation foil when said roll has reached its compressed state.

9. A method according to claim 8, wherein said method of compressing and fixating the roll furthermore comprises the step of relaxing and tightening said fixation foil after suspending and tightening during compression and before welding.

10. A method according to claim 8-9, wherein said step of compressing and fixating the roll furthermore comprises the steps of lifting the ends of said roll during compression.

Amended claims in accordance with Rule 137(2) EPC.

1. A vacuum packing machine (100) for packaging and compressing a roll of compressible material, such as insulation material, wherein said machine comprises

- means for compressing said roll to a compressed state by adding vacuum to said roll and
- means for fixating said roll in a compressed state by adding fixation foil around said compressed roll

characterised in, that said means for compressing and fixating the roll comprises
- means (113) for suspending and tightening said fixation foil around said roll during compression and
- means (109) for welding said tightened fixation foil when said roll has reached its compressed state and

wherein said means for compressing said roll are vacuum suction ends (101) positioned against each end of the roll sucking air out of said roll, while said foil is tightened and fixated around said roll.

2. A machine according to claim 1, wherein said means for suspending and tightening said fixation foil are two foil feeding cylinders (113), where said fixation foil is suspended between said pair of foil feeding cylinders and tightened by rotating said foil feeding cylinders in opposite directions.

3. A machine according to claim 1-2, wherein said means for welding are welding and cutting pieces wherein said pieces comprise means for welding in two positions and for cutting said foil between said two positions.

4. A machine according to claim 3, wherein said welding and cutting pieces are bars comprising two welding strips in mutual distance and cutting means between said strips.

5. A machine according to claim 1-4, wherein the machine comprises support means (103) for lifting the ends of said roll during compression.

6. A machine according to claim 5, wherein said support means are support belts (103) mounted on a support structure (105) for supporting said roll while being compressed, and wherein said support belts are adapted for being tightened for lifting said roll during compression.

7. A method for packaging and compressing a roll of compressible material, such as insulation material, wherein said method comprises

- compressing said roll to a compressed state by adding vacuum to said roll and
- fixating said roll in a compressed state by adding fixation foil around said compressed roll

characterised in, that said step of compressing and fixating the roll comprises the steps of

- suspending and tightening said fixation foil around said roll during compression and
- welding said tightened fixation foil when said roll has reached its compressed state.

wherein compressing is performed by vacuum suction ends (101) positioned against each end of the roll sucking air out of said roll, while said foil is tightened and fixated around said roll.

8. A method according to claim 7, wherein said method of compressing and fixating the roll furthermore comprises the step of relaxing and tightening said fixation foil after suspending and tightening during compression and before welding.

9. A method according to claim 7-8, wherein said step of compressing and fixating the roll furthermore comprises the steps of lifting the ends of said roll during compression.

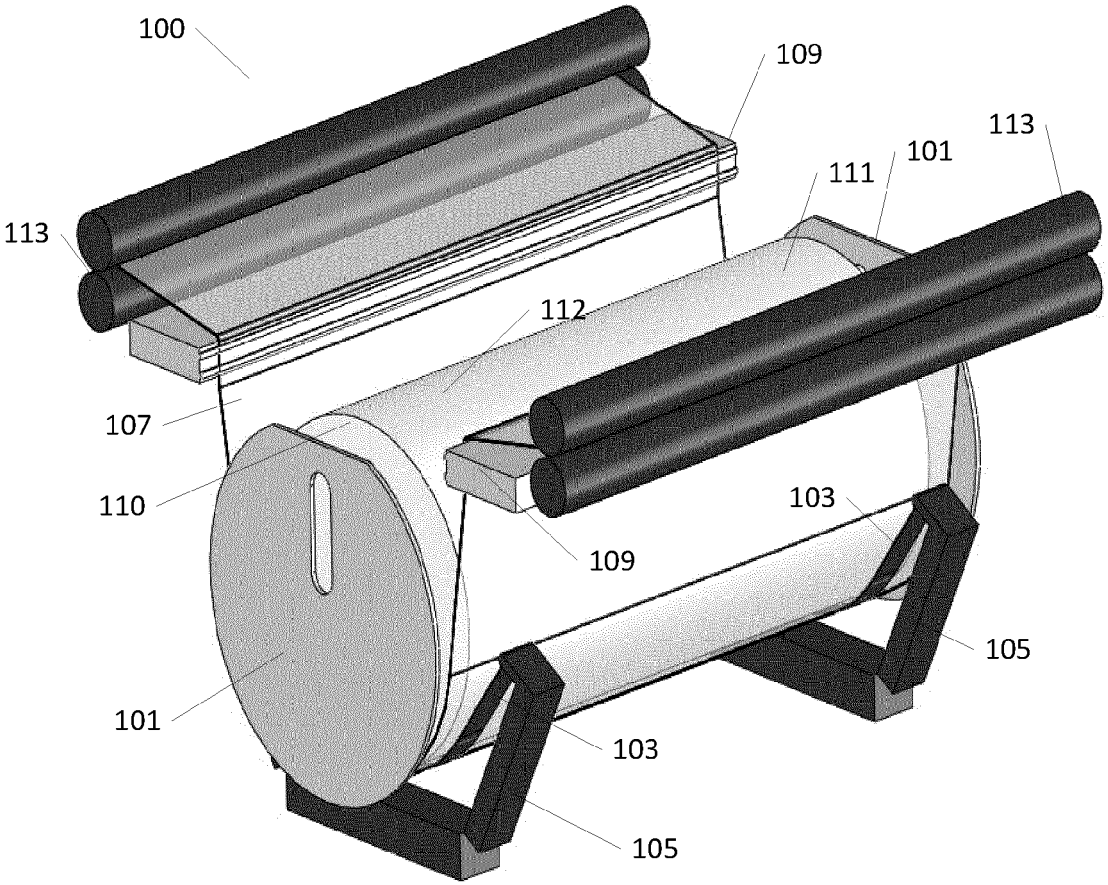
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Fig. 1

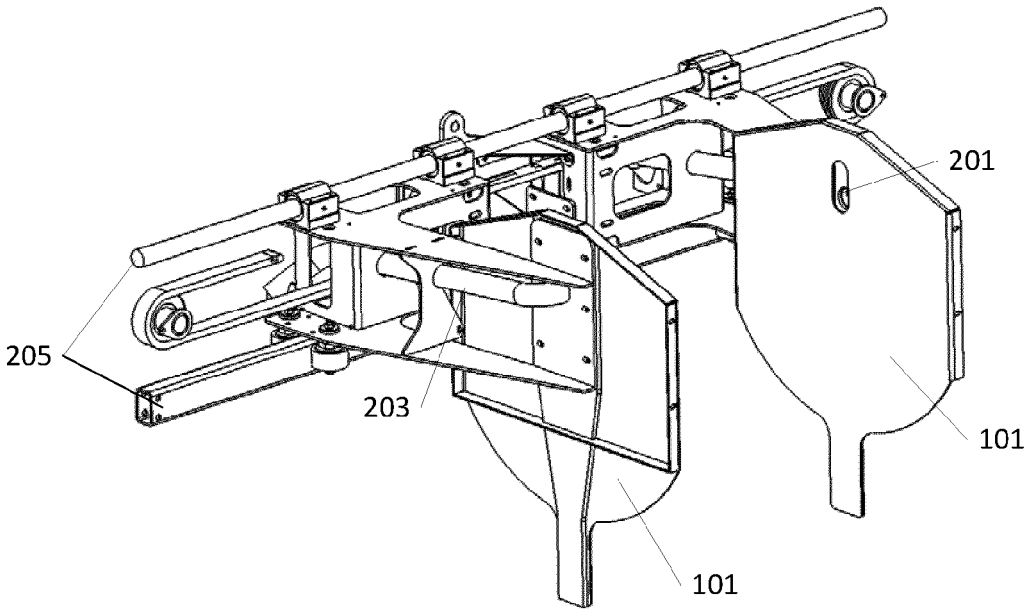
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Fig. 2

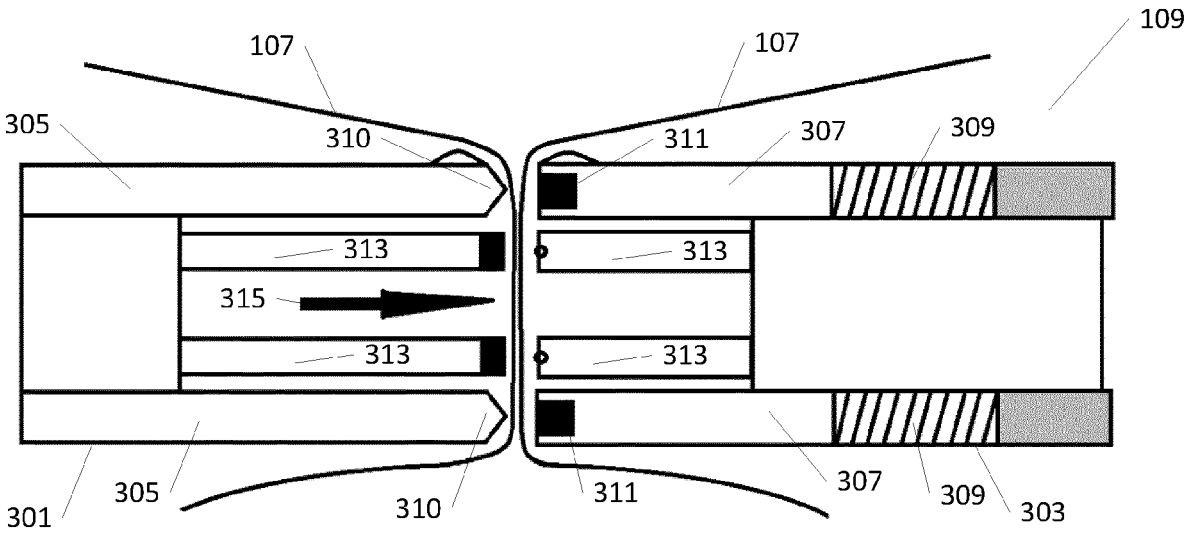
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Fig. 3

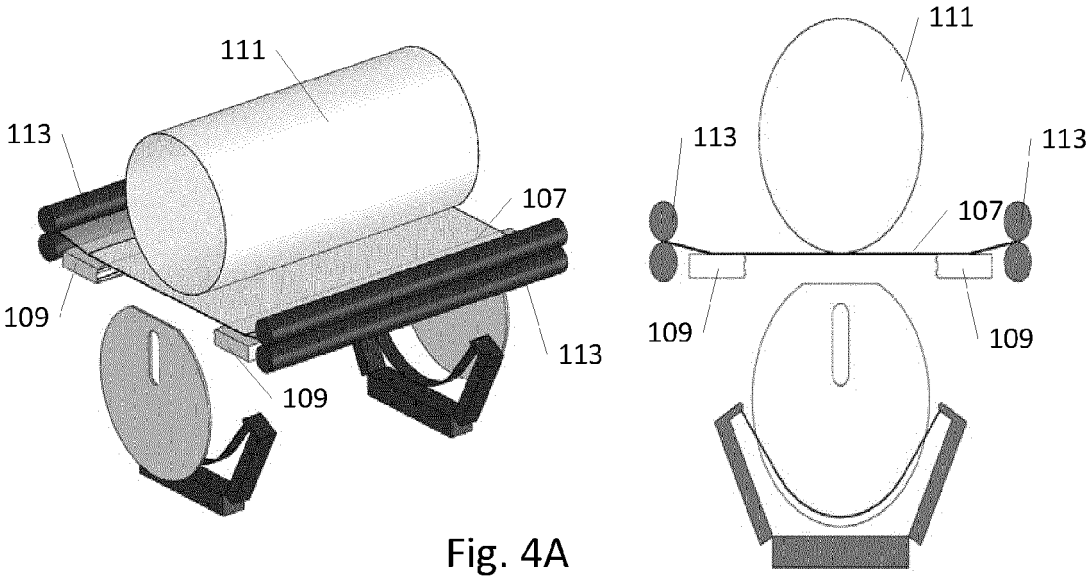
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Fig. 4A

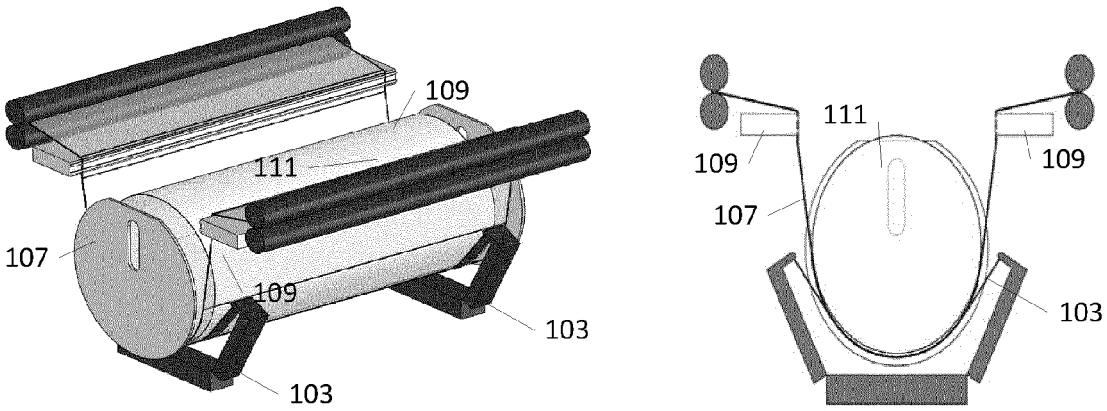
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Fig. 4B

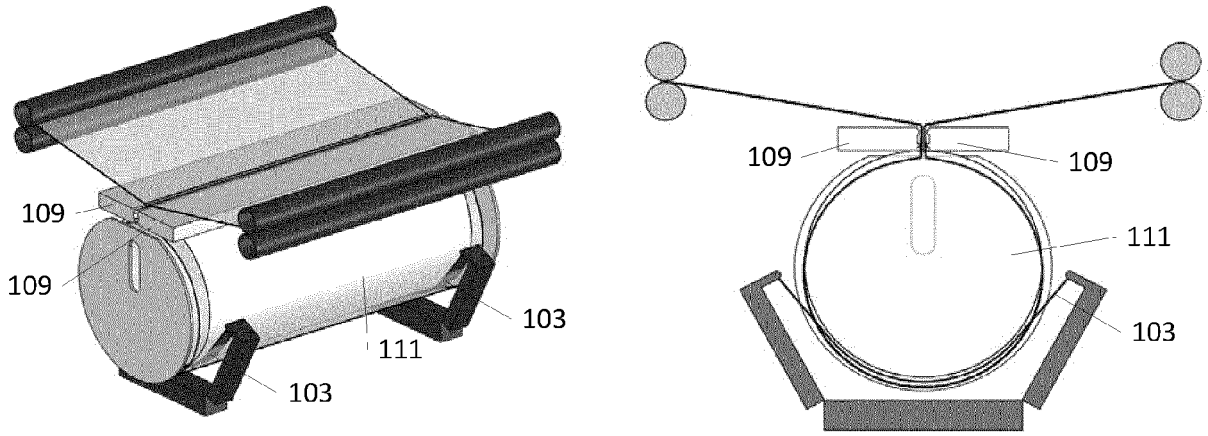
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Fig. 4C

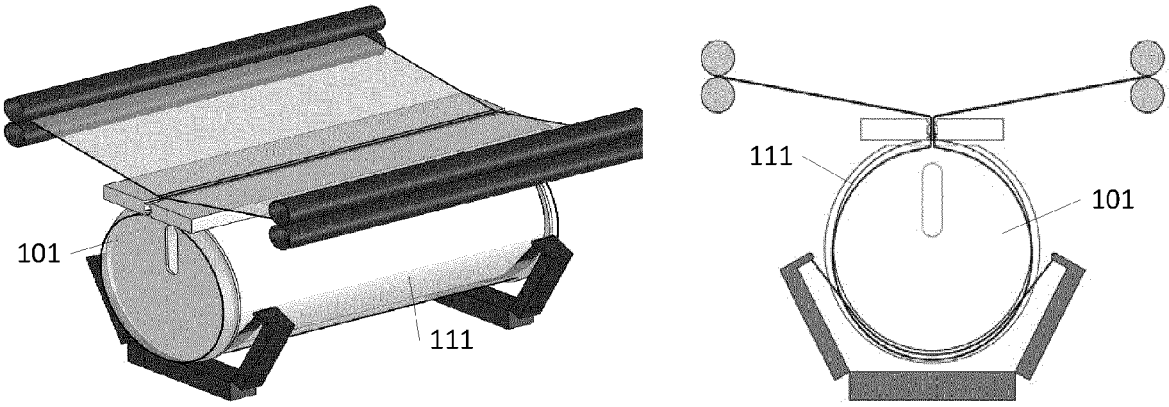

Fig. 4D

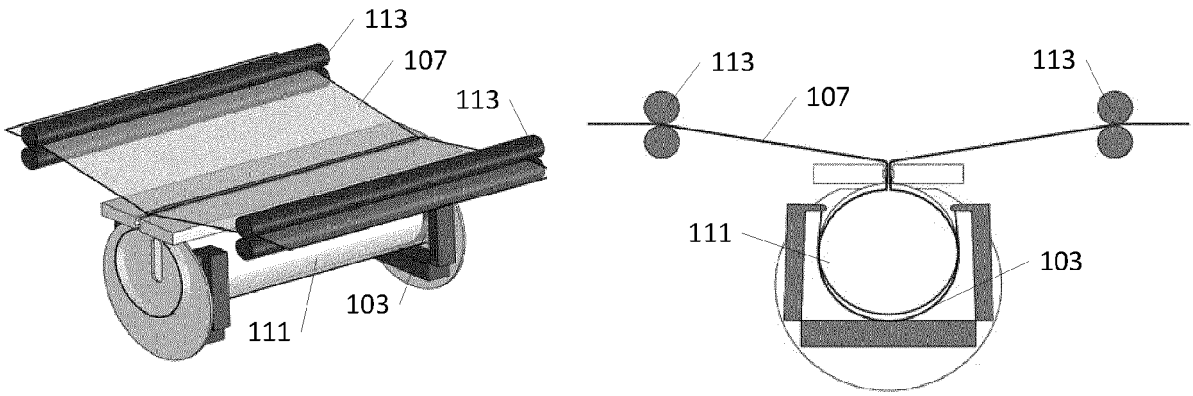

Fig. 4E

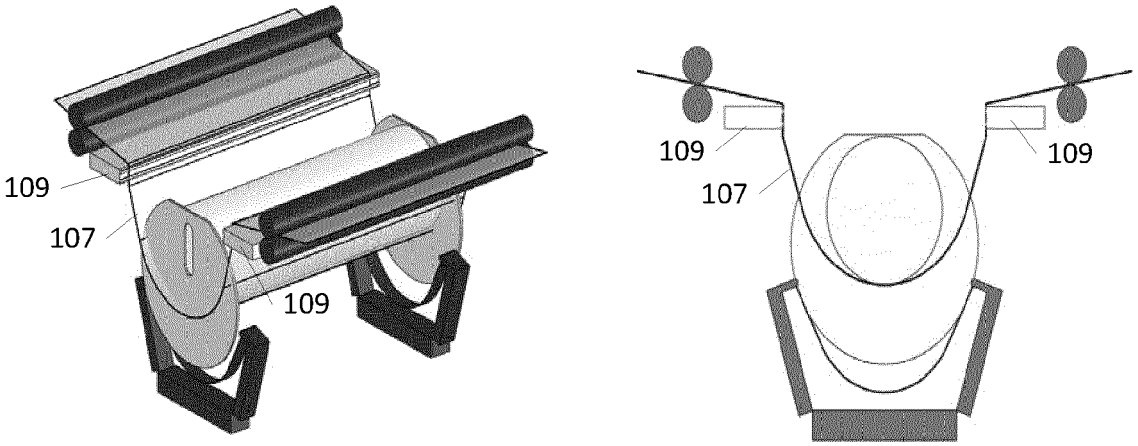

Fig. 4F

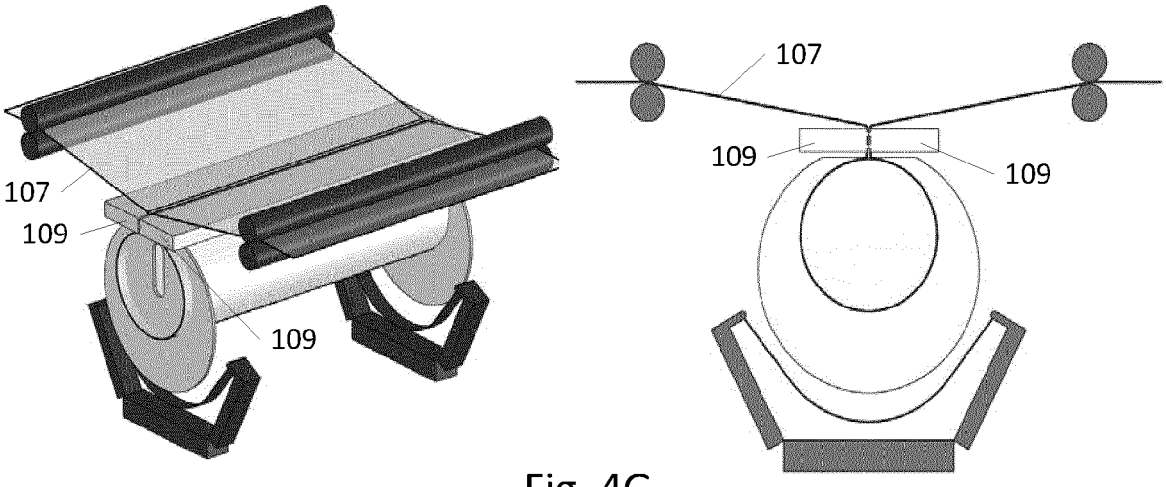

Fig. 4G

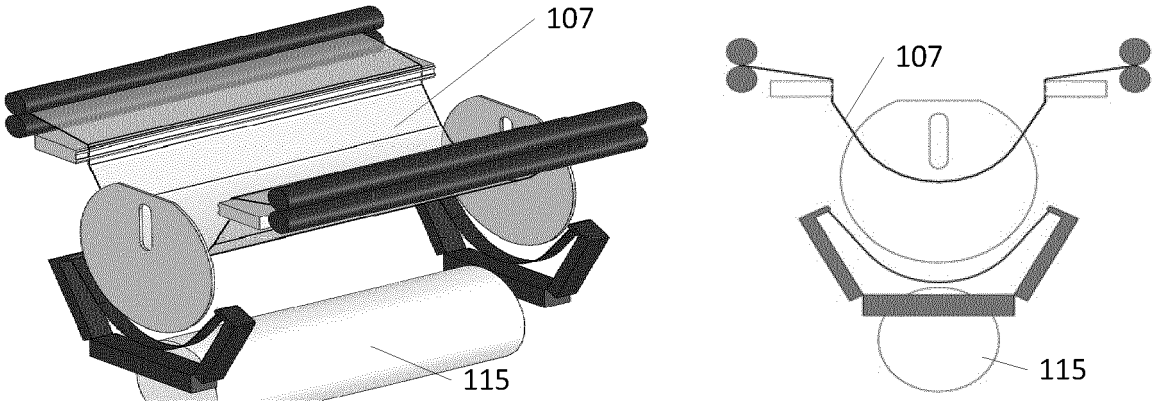

Fig. 4H

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EUROPEAN SEARCH REPORT

Application Number
EP 12 16 3146

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 400 569 A (JONES DAVID [GB] ET AL) 28 March 1995 (1995-03-28) * column 1, lines 13-16 * * column 4, line 57 - column 6, line 31; figures *	1,3,4,8	INV. B65B5/04 B65B11/10 B65B51/14 B65B63/02
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A	US 3 458 966 A (DUNBAR SIDNEY G ET AL) 5 August 1969 (1969-08-05) * the whole document *	1-10	
			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
Munich	28 August 2012	Philippon, Daniel

CATEGORY OF CITED DOCUMENTS

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