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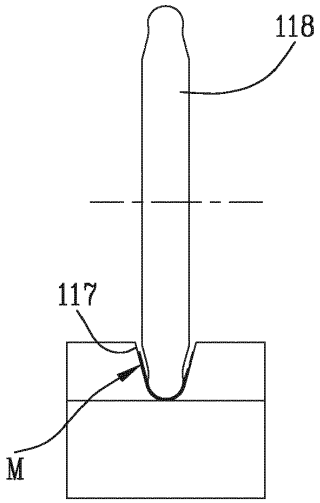
(54) METHOD AND MACHINE FOR MAKING PIECES OF A MULTILAYER, CYLINDRICAL TUBULAR ROD USED TO MAKE SUBSTANTIALLY CYLINDRICAL SMOKERS ARTICLES

(57) A machine (100) for making pieces of a multilayer, cylindrical tubular rod (1) suitable for making substantially cylindrical smokers' articles comprises first means (101) for feeding at least a first continuous web (102), second means (103) for feeding a second continuous web (104), means (107) for forming a continuous, multilayer web (M) by superposing at least a first layer (2) and a second layer (5) and means (108) for feeding the continuous, multilayer web along a feed direction (X). Also provided are means (110) for forming the rod (1) around the feed direction (X) and means (111) for cutting the rod (1) into pieces. The machine (100) is configured to dispose the lateral edges (4, 7) of at least one between the first and the second layer (2, 5) in such a way as to make at least one end-to-end splice (3, 6) and is equipped with a preforming device for producing a central shaping in the continuous, multilayer web (M) extending along the middle of the continuous, multilayer web (M) along the feed direction (X). The machine (100) implements a method for making pieces of a multilayer, cylindrical tubular rod (1).

Fig.12



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Description

Technical field

[0001] This invention relates to a method and a machine for making pieces of a multilayer, cylindrical tubular rod suitable for making substantially cylindrical smokers' articles.

Background art

[0002] As described in patent application WO2014/188318 machines are known in the prior art which are used to make smokers' articles where cylindrical components of smokers' products of any kind are wrapped in a multilayer web comprising strips suitable for imparting desired properties. The strips are made, for example, of a metallic material or a plastic material. Thus, the machine described in WO2014/188318 is suitable for directly making the pieces of smokers' articles by wrapping the multilayer web around the cylindrical components.

[0003] At present, therefore, no machine or method is available to provide pieces of a multilayer, cylindrical tubular rod suitable to be subsequently filled axially with the cylindrical components necessary to make the smokers' article. In effect, in this case, it would be necessary to have pieces of a multilayer, cylindrical tubular rod which comply with stringent dimensional and shape tolerances, with reference in particular to the internal diameter which has to receive the aforementioned components.

[0004] At present, prior art machines and methods are not capable of complying with specified tolerances because they are subject to errors in the positioning and/or alignment of individual layers of the multilayer web and to phase displacements between the process stations due, for example, to tension variations in the feeding of the continuous webs.

Disclosure of the invention

[0005] This invention therefore has for an aim to provide a method and a machine for making pieces of a multilayer, cylindrical tubular rod to overcome the disadvantages described above with reference to the prior art.

[0006] More specifically, the aim of this invention is to provide a method and a machine for making pieces of a multilayer, cylindrical tubular rod and capable of providing pieces of rod which comply with stringent dimensional and shape tolerances, with reference in particular to the internal diameter. Another aim of this invention is to provide a method and a machine for making pieces of a multilayer, cylindrical tubular rod and capable of adapting to different types of products to be made and of making a reliable product which, in particular, guarantees complete closure along the circumferential direction and correct circumferential and longitudinal positioning of the different layers.

[0007] These aims are achieved by a method and a machine for making pieces of a multilayer, cylindrical tubular rod having the features set out in one or more of the appended claims.

[0008] Advantageously, carrying out a preforming of the multilayer web by a preforming device allows for a better shaping of the rod with increase of the quality of the cut rod segments.

Brief description of the drawings

[0009] Further features and advantages of the invention are more apparent from the following exemplary and therefore non-limiting description of a preferred and hence non-exclusive embodiment of a piece of a multilayer, cylindrical tubular rod suitable for making substantially cylindrical smokers' articles, and a method and machine for making pieces of a multilayer, cylindrical tubular rod suitable for making substantially cylindrical smokers' articles.

[0010] The invention is described below with reference to the accompanying drawings, which illustrate a non-limiting embodiment of it and in which:

- Figures 1a, 1b and 1c show, respectively, a transverse cross section, a product schematic and a longitudinal cross section of a first embodiment of a multilayer, cylindrical tubular rod;
- Figures 2a-2c, 3a-3c, 4a-4c and 5a-5c show respective variants of Figures 1a, 1b and 1c;
- Figures 6a-6c show a further variant of Figures 1a, 1b and 1c and Figure 6d shows a further product schematic;
- Figure 7 is a schematic front view of a machine for making pieces of a multilayer, cylindrical tubular rod a filter rod, according to a first embodiment;
- Figure 8 is a schematic front view of a machine for making pieces of a multilayer, cylindrical tubular rod according to a second embodiment;
- Figure 9 shows an enlarged detail from Figure 7;
- Figure 10 is a side view of the detail of Figure 9;
- Figure 11 shows an enlarged detail from Figure 7 representing the current invention;
- Figure 12 is a side view of the detail of Figure 11.

Detailed description of preferred embodiments of the invention

[0011] With reference to the accompanying drawings, the numeral 1 denotes a multilayer, cylindrical tubular rod from which pieces suitable for making substantially cylindrical smokers' articles are obtained.

[0012] The rod 1, and thus a piece of it not illustrated, comprises a first layer 2 of a first material. The first layer 2 is spliced longitudinally to form a first splice 3 of respective lateral edges 4 of the first layer 2.

[0013] The rod 1, and thus a piece of it not illustrated,

comprises a second layer 5 of a second material. The second layer 5 is spliced longitudinally to form a second splice 6 of respective lateral edges 7 of the second layer 5.

[0014] The first layer 2 occupies a radially inner position relative to the second layer 5 in both the piece and the rod 1.

[0015] The second layer 5 is continuous along a main direction of extension "X" of the rod 1, coinciding with the feed direction of the rod during production of the pieces.

[0016] At least one between the first splice 3 and the second splice 6 is made as an end-to-end splice, that is, a splice made without overlapping the two respective lateral edges.

[0017] The first material and the second material are different. For example, the first material may be a metallic material and the second material may be a paper material.

[0018] Figures 1a and 1c illustrate a rod 1 where the first layer 2 is also continuous along the main direction of extension "X" of the rod 1. Further, both the first splice 3 and the second splice 6 are end-to-end splices and are offset from each other, that is, they are disposed at different angular positions around the direction "X". Figure 1b illustrates a step in the production of the rod 1 from a continuous multilayer web "M" comprising the first layer 2 and the second layer 5, both laid out flat. Also illustrated is an intermediate layer 8 of adhesive material interposed between the first layer 2 and the second layer 5.

[0019] Figures 2a and 2c illustrate a rod 1 comprising a third layer 9 occupying a radially outer position relative to the first layer 2 and second layer 5. The third layer 9 is spliced longitudinally to form a third splice 10 of respective lateral edges 4 of the third layer 9. Both the first splice 3 and the second splice 6 are end-to-end splices and preferably are disposed at the same angular position around the direction "X". The third splice 10 is an end-to-end splice and is offset relative to the first and second splices, that is, disposed at a different angular position around the direction "X".

[0020] Again with reference to Figures 2a and 2c, the first layer 2 is discontinuous and comprises, along the feed direction, a sequence of strips 14 alternated with empty spaces 15. In this case, complete closure of the rod 1 is guaranteed by the third layer 9 and the third splice 10 offset from the other splices.

[0021] Figure 2b illustrates a step in the production of the rod 1 from a continuous multilayer web "M" comprising the first layer 2, the second layer 5 and the third layer 9, all laid out flat. Also illustrated is the intermediate layer 8 of adhesive material interposed between the first layer 2 and the second layer 5 and a further intermediate adhesive layer 12 interposed between the second layer 5 and the third layer 9. The third layer is offset along a direction perpendicular to the direction "X" relative to the first and second layers, so as to offset the respective third splice 10 relative to the first splice 3 and second splice 6.

[0022] The second layer 5 and the third layer 9 have the same thickness and are preferably obtained by dividing a single continuous web longitudinally, as described hereinafter.

[0023] Figures 3a and 3c illustrate a rod 1 comprising the third layer 9 occupying a radially outer position relative to the first layer 2 and second layer 5. The third layer 9 is spliced longitudinally to form the third splice 10 of respective lateral edges 4 of the third layer 9. Unlike the rod of Figures 2a and 2c, the second layer 5 and the third layer 9 have different thicknesses: in particular, the second layer 5 is smaller in thickness than the third layer 9. In this case, the function of the second layer 5 is that of transporting the first layer 2. Thanks to the reduced thickness, it is easier to wrap it around itself and it may be made in such a way as to better absorb the adhesive material of the intermediate layer 8. The third layer 9 acts mainly as a supporting layer and gives the rod 1 and the related pieces the stiffness necessary to keep their shape.

[0024] Again with reference to Figures 3a and 3c, the first layer 2 is discontinuous and comprises, along the feed direction, the sequence of strips 14 alternated with empty spaces 15. In this case, complete closure of the rod 1 is guaranteed by the third layer 9 and the third splice 10 offset from the other splices. Figure 3b is similar to Figure 2b.

[0025] Figures 4a and 4c illustrate a rod 1 comprising the third layer 9 occupying a radially outer position relative to the first layer 2 and second layer 5. The third layer 9 is spliced longitudinally to form the third splice 10 of respective lateral edges 4 of the third layer 9. Unlike the rod of Figures 2a and 2c, the second layer 5 and the third layer 9 have different thicknesses: in particular, the second layer 5 is larger in thickness than the third layer 9. In this case, the second layer 5 acts both as a layer for transporting the first layer 2 and as a supporting layer giving the rod 1 and the related pieces the stiffness necessary to keep their shape. The functions of the third layer 9 are mainly to improve aesthetic appearance and to help keep the second layer 5 closed.

[0026] Again with reference to Figures 4a and 4c, the first layer 2 is discontinuous and comprises, along the feed direction, the sequence of strips 14 alternated with empty spaces 15. In this case, complete closure of the rod 1 is guaranteed by the third layer 9 and the third splice 10 offset from the other splices. Figure 4b is similar to Figure 2b.

[0027] Figures 5a and 5c illustrate a rod 1 comprising the third layer 9 occupying a radially outer position relative to the first and second layers. The third layer 9 is spliced longitudinally to form the third splice 10 of respective lateral edges 4 of the third layer 9. Unlike the rod of Figures 2a and 2c, the third splice 10 is an overlapping splice and is preferably offset from the first splice 3 or the second splice 6, that is, is disposed at a different angular position around the direction "X".

[0028] Again with reference to Figures 5a and 5c, the first layer 2 is discontinuous and comprises, along the

feed direction, a sequence of strips 14 alternated with empty spaces 15. In this case, the complete closure of the rod 1 is guaranteed by the third layer 9 and the third splice 10 which is offset from the other splices and is an overlapping splice.

[0029] Figure 5b illustrates a step in the production of the rod 1 from a continuous multilayer web "M" comprising the first layer 2, the second layer 5 and the third layer 9, all laid out flat. Also illustrated is the intermediate layer 8 of adhesive material interposed between the first layer 2 and the second layer 5 and the further intermediate adhesive layer 12 interposed between the second layer 5 and the third layer 9. The third layer 9 is aligned at least at one of the lateral edges of the first layer 2 and second layer 5.

[0030] Figures 6a and 6c illustrate a rod 1 comprising the third layer 9 occupying a radially outer position relative to the first and second layers. The third layer 9 is spliced longitudinally to form the third splice 10 of respective lateral edges 4 of the third layer 9. Unlike the rod of Figures 2a and 2c, the first splice 3 is an overlapping splice, the second splice 6 is an end-to-end splice and the third splice 10 is an overlapping splice and is preferably offset from the first splice 3 or the second splice 6. The second layer 5 and the third layer 9 have different thicknesses: in particular, the second layer 5 is larger in thickness than the third layer 9.

[0031] Again with reference to Figures 6a and 6c, the first layer 2 is discontinuous and comprises, along the feed direction, a sequence of strips 14 alternated with empty spaces 15. In this case, complete closure of the rod 1 is guaranteed by the third layer 9 and the third splice 10 offset from the other splices. The continuity of the first layer 2 along a circumferential direction is guaranteed by the first splice 3, which is an overlapping splice. Figure 6b illustrates a step in the production of the rod 1 from a continuous multilayer web "M" comprising the first layer 2 and the second layer 5, which are laid out flat and which, when subsequently wrapped on themselves, form an intermediate rod 13. Also illustrated is the intermediate layer 8 of adhesive material interposed between the first layer 2 and the second layer 5. Figure 6d illustrates a further step in the production of the rod 1 from the intermediate rod 13 and the third layer 9. The third layer 9 will be wrapped around the intermediate rod 13 to form the rod 1. Also shown is the further intermediate adhesive layer 12 interposed between the second layer 5 and the third layer 9.

[0032] In all the examples illustrated and/or described above, the first material may comprise one or more of the following: a metallic material, a plastic material, a paper material.

[0033] Figures 7 and 8 illustrate two possible embodiments of a machine 100 for making pieces of a multilayer, cylindrical tubular rod 1 suitable for making substantially cylindrical smokers' articles. More specifically, the machine 100 is adapted to make a piece of a rod 1 according to one or more of the examples illustrated and/or described above.

[0034] The machine 100 comprises first means 101 for feeding at least a first continuous web 102 of a first material suitable for making the first layer 2 of a continuous, multilayer web "M" and of the rod 1.

[0035] The machine 100 comprises second means 103 for feeding a second continuous web 104 of the second material suitable for making a second continuous layer 5 of the continuous, multilayer web "M" and of the rod 1.

[0036] The first continuous web 102 and/or the second continuous web 104 are preferably provided on rolls "B" unwound by respective means 102, 103 for feeding the continuous webs.

[0037] Located along the feed path of the second continuous web 104 there is a gluing device 105 configured to apply a layer of adhesive material on the second continuous web 104 to define the intermediate layer 8 of adhesive material of the rod 1. The intermediate layer 8 is preferably continuous. The gluing device 105 may be embodied, for example by rollers, sprayers or in other ways.

[0038] Located along the feed path of the first continuous web 102 there may be a cutting device 106 configured to cut the first continuous web 102 into strips 14. The cutting device 106 is provided when the first layer 2 is discontinuous, that is to say, when it comprises a sequence of strips 14 alternated with empty spaces 15. The cutting device 106 may be a cutter of the impact or scissor type or it may be embodied in other ways.

[0039] The numeral 107 denotes means for forming the continuous, multilayer web "M" by superposing at least the first layer 2 and the second layer 5. These means may, for example, comprise a bed 107a embodied by a conveyor 108 adapted to receive the second continuous web 104 defining the second layer 5 and the strips 14 of the first continuous web 102 defining the first, discontinuous layer 2 (alternatively, the conveyor receives the first continuous web 102 defining the first continuous layer 2). The conveyor 108 is also adapted to feed the continuous, multilayer web "M" along the feed direction "X" and thus also embodies means for feeding the continuous, multilayer web "M" along the feed direction "X". Preferably, the conveyor 108 receives the second continuous web 104 with the intermediate layer 8 which is applied thereon and on which the strips 14 of the first continuous web 102 are placed by a drum 109 associated with the cutting device 106.

[0040] Downstream of the drum 109, therefore, the continuous, multilayer web "M" obtained is such that the first layer 2 in the rod 1 occupies a radially inner position relative to the second layer 5.

[0041] Downstream of the conveyor 108, means 110 are provided for forming the rod 1 around the feed direction "X" making the splices of the layers making up the rod itself;

The means 110 may comprise a forming beam 110a having a groove whose cross section is variable along the

feed direction "X" in such a way as to wrap the continuous, multilayer web "M" around the feed direction "X" to make the rod 1.

[0042] Downstream of the means 110 for forming the rod 1 there are means 111 for cutting the rod 1 into pieces.

[0043] Advantageously, the machine 100 is configured to dispose the lateral edges of at least one between the first layer 2 and the second layer 5 in such a way as to make at least one between the first splice 3 and the second splice 6 as an end-to-end splice.

[0044] As illustrated in Figures 7 and 8, third means 112 may be provided for feeding a third continuous web 113 of a third material suitable for making the third layer 9 of the rod 1. The third continuous web 113, hence the third layer 9, is disposed in such a way as to occupy, in the rod 1, a radially outer position relative to the first layer 2 and second layer 5. Along the feed path of the third continuous web 113 there is a gluing device 105a configured to apply the further intermediate adhesive layer 12 interposed between the second layer 5 and the third layer 9. The gluing device 105 may be embodied, for example by rollers, sprayers or in other ways.

[0045] In the example shown in Figure 7, the third means 112 feed the third web 113 downstream of the conveyor 108 and upstream of the means 110 to form the third layer 9. Thus, the first layer 2, the second layer 5 and the third layer 9 form the continuous, multilayer web "M" and are wrapped together on themselves along the forming beam 110a.

[0046] If necessary, the machine 100 may comprise two blades 114 located on opposite sides of the continuous, multilayer web "M" and configured to trim the edges thereof. In the case of Figure 7, the blades 114 are circular blades which use as their anvil element a flat surface 115 on which at least one active portion of the conveyor 108 slides. The blades are located downstream of the drum 109 and thus trim the continuous, multilayer web "M" comprising the first layer 2 and the second layer 5.

[0047] According with the invention, the machine 100 comprises a forming device 116 configured to preform the continuous, multilayer web "M" before it is wrapped on itself to form the rod 1. Figures 11 and 12 illustrate a possible example of the forming device 116, which can be used in any machine for forming a rod 1 and which comprises a moulded groove 117, adapted to receive the continuous, multilayer web "M", and a forming element - for example a wheel 118 preferably rotating about a horizontal axis perpendicular to the feed direction "X" - which fits at least partly in the moulded groove 117 to make in the continuous, multilayer web a grooved shape extending along the middle of it in the feed direction "X". The forming device 116 may act on a continuous, multilayer web "M" comprising only the first layer 2 and the second layer 5 or, as illustrated in Figure 7, on a continuous, multilayer web "M" comprising the first layer 2, the second layer 5 and the third layer 9.

[0048] As can be seen in figure 12, the wheel 118 has a central disc-shaped portion having a tapered periphery ending in a rounded rim which, in transverse section, has the shape of an arc of circumference, in particular about half of a circumference.

[0049] Preferably, between the tapered periphery and the rounded rim of the wheel 118 an annular portion is provided, with has parallel flanks perpendicular to the axis of rotation of the wheel 118.

[0050] Moreover, as can be seen in figure 12, the moulded groove 117 and the wheel 118 have a transversal outline that causes the wheel 118 to enter in contact with the continuous, multilayer web "M" only at the rounded rim of the wheel 118.

[0051] As can be seen in figure 11, the forming element (wheel 118) is located at the infeed portion of the moulded groove 117 along the feed direction "X".

[0052] The machine 100 illustrated in Figure 8 differs from the machine illustrated in Figure 7 in that it comprises two forming beams. The first forming beam 110a is similar to the one illustrated in Figure 7 and is configured to make the rod 1. A further forming beam 119 is located at the conveyor 108 to wrap the continuous, multilayer web "M", comprising the first layer 2 and the second layer 5, on itself to form the intermediate rod 13. The third continuous web 113 is fed between the further forming beam 119 and the forming beam 110a to wrap the third continuous web 113 around the intermediate rod 13 to form the rod 1.

[0053] In use, the machine 100 is adapted to function according to a method for making pieces of a multilayer, cylindrical tubular rod suitable for making substantially cylindrical smokers' articles.

[0054] The above mentioned method comprises a step a) of feeding at least a first continuous web 102 of a first material suitable for making a first layer 2 of a continuous, multilayer web "M". This step is carried out, for example, by the first feed means 101.

[0055] The above mentioned method comprises a step b) of feeding a second continuous web 104 of a second material suitable for making a second continuous layer 5 of the continuous, multilayer web "M". This step is carried out, for example, by the second feed means 103.

[0056] Preferably, there is a step f) of feeding a third continuous web 113 of a third material suitable for making a third layer 9 of the rod 1. The third layer 9 is disposed in such a way as to occupy, in the rod 1, a radially outer position relative to the first layer 2 and second layer 5.

[0057] The above mentioned method comprises a step c) of forming the continuous, multilayer web "M" by superposing at least the first layer 2 and the second layer 5, where the first layer 2 is positioned in such a way as to occupy, in the rod 1, a radially inner position relative to the second layer 5, and feeding the continuous, multilayer web "M" along a feed direction "X". This step is carried out, for example, at the means 107 and at the conveyor 108.

[0058] The above mentioned method comprises a step d) of wrapping the continuous, multilayer web "M" around the feed direction "X", making at least a first splice 3 of

the lateral edges of the first layer 2 and a second splice 6 of the lateral edges of the second layer 5, to form the rod 1. This step may be carried out in the forming beam 110a to form a continuous, multilayer web "M" comprising the first layer 2, the second layer 5 and possibly also the third layer 9, or in the forming beam 119 to form a continuous, multilayer web "M" comprising the first layer 2 and the second layer 5. In the latter case, the forming of the rod 1 may, if necessary, be completed by wrapping the third layer 9 around the intermediate rod 13. The above mentioned method comprises a step e) of cutting the rod 1 into pieces.

[0059] Steps a) to e) are carried out in a single machine 100 to make a multilayer, cylindrical tubular rod 1. Also, step d) is carried out by disposing the lateral edges of at least one between the first layer 2 and the second layer 5 in such a way as to make at least one between the first splice 3 and the second splice 6 as an end-to-end splice.

[0060] Preferably, there is a step of making strips 14 of the first continuous web 102 and making a first, discontinuous layer 2 along the feed direction "X" where the first, layer 2 comprises, along the feed direction, a sequence of strips 14 alternated with empty spaces 15. This step is carried out, for example, by the cutting device 106.

[0061] If necessary, there may be a step of feeding a single continuous web suitable for making the second layer 5 and the third layer 9 and a step of dividing the single continuous web longitudinally into two continuous web portions respectively defining the second continuous web 104 and the third continuous web 113. In this case, the second continuous web 104 and the third continuous web 113 have the same thickness. Alternatively, the second continuous web 104 and the third continuous web 113 have different thicknesses.

[0062] As illustrated in Figure 7, step c) comprises first forming the continuous, multilayer web "M" by superposing the first layer 2 and the second layer 5 and then adding the third layer 9. The continuous, multilayer web "M" thus obtained (that is to say, comprising the first layer 2, the second layer 5 and the third layer 9) is wrapped on itself around the feed direction "X" to form the rod 1.

[0063] In a possible embodiment, step d) may be carried out by disposing the lateral edges of the first layer 2 in such a way as to make a first end-to-end splice 3 and disposing the lateral edges of the second layer 5 in such a way as to make a second end-to-end splice 6.

[0064] In this case, step c) might comprise the step of offsetting the third layer 9 relative to at least one between the first and the second layer along a direction perpendicular to the feed direction "X" and step d) might be carried out by disposing the lateral edges of the third layer in such a way as to make a third end-to-end splice 10 (Figures 2a-4a). Alternatively, step d) might be carried out by disposing the lateral edges of the third layer 9 in such a way as to make the third splice an overlapping splice (Figure 5a). As illustrated in Figure 8, step c) comprises forming the continuous, multilayer web "M" by superposing the first layer 2 and the second layer 5. Next, the continuous, multilayer web "M" is wrapped on itself to form an intermediate rod 13 and juxtaposed with the third continuous web 113, that is, with the third layer 9, to wrap the third continuous web 113 around the intermediate rod 13 to form the rod 1. In other words., there is a step g) of wrapping the third layer 9 around the intermediate rod 13 already formed by wrapping the first and second layers around themselves. Preferably, step d) may be carried out by disposing the lateral edges 4 of the first layer 2 in such a way as to make at least a first, overlapping splice 3 and disposing the lateral edges 7 of the second layer 5 in such a way as to make a second, end-to-end splice 6. Preferably, step g) is carried out by disposing the lateral edges 11 of the third layer 9 in such a way as to make a third, overlapping splice 10 (Figure 6a).

[0065] If necessary, the edges of the continuous, multilayer web "M" might be trimmed before the web is wrapped on itself to form a multilayer, cylindrical tubular rod. More specifically, the edges of the continuous, multilayer web "M" formed by the first layer 2 and second layer 5 might be trimmed in an embodiment where there is a third layer 9.

[0066] Advantageously, before the continuous, multilayer web "M" is wrapped on itself to form the rod 1, it is preformed by making in the continuous, multilayer web "M" a grooved shaping extending along the feed direction "X".

[0067] In an alternative not illustrated, the machine 100 is adapted to make rods 1 which comprise only the first layer 2 and the second layer 5 with a first and a second end-to-end splice. In this case, the first layer 2 is continuous along the feed direction "X" and the first layer 2 and second layer 5 are offset in a direction perpendicular to the feed direction "X".

[0068] Even independently of what is described in the foregoing, the method according to this invention may involve a second layer 2 and a third layer 9 having the same thickness or different thicknesses. In the first case, there may be a step of feeding a single continuous web suitable for making the second and third layers and a step of dividing the single continuous web longitudinally into two continuous web portions respectively defining the second continuous web 104 and the third continuous web 113.

Claims

1. A method for making pieces of a multilayer, cylindrical tubular rod (1) suitable for making substantially cylindrical smokers' articles, comprising the steps of:

   a) feeding at least a first continuous web (102) of a first material suitable for making a first layer (2) of a continuous, multilayer web (M);
   b) feeding a second continuous web (104) of a second material suitable for making a second

continuous layer (5) of the continuous, multilayer web (M);

c) forming the continuous, multilayer web (M) by superposing at least the first layer (2) and the second layer (5) with an intermediate layer (8) of adhesive material interposed between the first layer (2) and the second layer (5), wherein the first layer (2) is positioned in such a way as to occupy, in the rod (1), a radially inner position relative to the second layer (5), and feeding the continuous, multilayer web (M) along a feed direction (X);

d) wrapping the continuous, multilayer web (M) around the feed direction (X), making at least a first splice (3) of the lateral edges (4) of the first layer (2) and a second splice (6) of the lateral edges (7) of the second layer (5), to obtain a rod (1);

e) cutting the rod (1) into pieces;

characterized in that it comprises preforming the continuous, multilayer web (M), before wrapping it and forming a multilayer, cylindrical tubular rod (1), preferably producing a central shaping extending along the middle of the continuous, multilayer web in the feed direction (X).

2. The method for making pieces of a multilayer, cylindrical tubular rod according to claim 1, wherein the step of preforming the continuous, multilayer web (M), is performed by a moulded groove (117) into which the continuous, multilayer web (M) is received and by a forming element which fits at least partly in the moulded groove (117) to make said grooved shaping in the continuous, multilayer web (M).

3. The method for making pieces of a multilayer, cylindrical tubular rod according to claim 2, wherein the forming element is a wheel (118) in particular rotating about a horizontal axis perpendicular to the feed direction (X).

4. The method for making pieces of a multilayer, cylindrical tubular rod according to claim 3, wherein the wheel (118) has a central disc-shaped portion having a tapered periphery ending in a rounded rim which, in transverse section, has the shape of an arc of circumference, in particular about half of a circumference; preferably, between the tapered periphery and the rounded rim being provided an annular portion with parallel flanks perpendicular to the axis of rotation of the wheel (118).

5. The method for making pieces of a multilayer, cylindrical tubular rod according to claim 4, wherein the moulded groove (117) and the wheel (118) have a transversal outline that causes the wheel (118) to enter in contact with the continuous, multilayer web (M) only at the rounded rim of the wheel (118).

6. The method for making pieces of a multilayer, cylindrical tubular rod according to any of the preceding claims from 2 to 5, wherein the forming element is located at an infeed portion of the moulded groove (117) along the feed direction (X).

7. The method for making pieces of a multilayer, cylindrical tubular rod according to any of the preceding claims, wherein it comprises a step f) of feeding a third continuous web (113) of a third material suitable for making a third layer (9) of the rod (1), wherein the third layer (9) is added on the superposed first and second layers (2, 5) by interposing a further intermediate adhesive layer (12) between the second layer and the third layer (5, 9), and wherein the third layer (9) is positioned in such a way as to occupy, in the rod (1), a radially outer position relative to the first and second layers (2, 5).

8. The method for making pieces of a multilayer, cylindrical tubular rod according to any of the preceding claims, wherein steps a)-e) are performed on a single machine (100) for making a multilayer, cylindrical tubular rod (1) wherein the step d) is accomplished by disposing the lateral edges (4, 7) of at least one between the first and the second layer (2, 5) in such a way as to make at least one between the first and the second splice (3, 6) as an end-to-end splice.

9. A machine (100) for making pieces of a multilayer, cylindrical tubular rod suitable for making substantially cylindrical smokers' articles, **characterized in that** it comprises:

first means (101) for feeding at least a first continuous web (102) of a first material suitable for making a first layer (2) of a continuous, multilayer web (M);

second means (103) for feeding a second continuous web (104) of a second material suitable for making a second continuous layer (5) of the continuous, multilayer web (M);

means (107) for forming the continuous, multilayer web (M) by superposing at least the first layer (2) and the second layer (5), wherein the first layer (2) is positioned in such a way as to occupy, in the rod (1), a radially inner position relative to the second layer (5), and means (108) for feeding the continuous, multilayer web along a feed direction (X);

a gluing device (105) configured to release an intermediate layer (8) of adhesive material between the first and second layer (2, 5), in particular configured to apply a layer of adhesive material on the second continuous web (104);

means (110) for forming the rod (1) around the feed direction (X) making the splices (3, 6, 10) of the layers making up the rod itself;

means (111) for cutting the rod (1) into pieces;
a forming device (116) configured to preform the continuous, multilayer web (M) before it is wrapped to form the rod (1), preferably producing a central shaping extending along the middle of the continuous, multilayer web in the feed direction (X).

10. The machine for making pieces of a multilayer, cylindrical tubular rod according to claim 9, wherein the forming device (116) comprises a moulded groove (117) into which the continuous, multilayer web (M) is received and a forming element which fits at least partly in the moulded groove (117) to make said grooved shaping in the continuous, multilayer web (M).

11. The machine for making pieces of a multilayer, cylindrical tubular rod according to claim 10, wherein the forming element is a wheel (118) in particular rotating about a horizontal axis perpendicular to the feed direction (X).

12. The machine for making pieces of a multilayer, cylindrical tubular rod according to claim 11, wherein the wheel (118) has a central disc-shaped portion having a tapered periphery ending in a rounded rim which, in transverse section, has the shape of an arc of circumference, in particular about half of a circumference; preferably, between the tapered periphery and the rounded rim being provided an annular portion with parallel flanks perpendicular to the axis of rotation of the wheel (118).

13. The machine for making pieces of a multilayer, cylindrical tubular rod according to claim 12, wherein the moulded groove (117) and the wheel (118) have a transversal outline that causes the wheel to enter in contact with the continuous, multilayer web (M) only at the rounded rim of the wheel.

14. The machine for making pieces of a multilayer, cylindrical tubular rod according to any of the preceding claims from 10 to 13, wherein the forming element is located at an infeed portion of the moulded groove (117) along the feed direction (X).

15. The machine (100) for making pieces of a multilayer, cylindrical tubular rod according to any of preceding claims 9 to 14, further comprising third means (112) for feeding a third continuous web (113) of a third material suitable for making a third layer (9) of the rod (1) and a further gluing device (105a) configured to apply a further intermediate adhesive layer (12) interposed between the second layer (5) and the third layer (9), in particular located along a feed path of the third continuous web (113), wherein the third layer (9) is positioned in such a way as to occupy, in the rod (1), a radially outer position relative to the first and second layers (2, 5).

16. The machine (100) for making pieces of a multilayer, cylindrical tubular rod according to any of preceding claims 9 to 15, wherein the machine (100) is configured to dispose the lateral edges (4, 7) of at least one between the first and the second layer (2, 5) in such a way as to make at least one between the first and the second splice (3, 6) as an end-to-end splice.

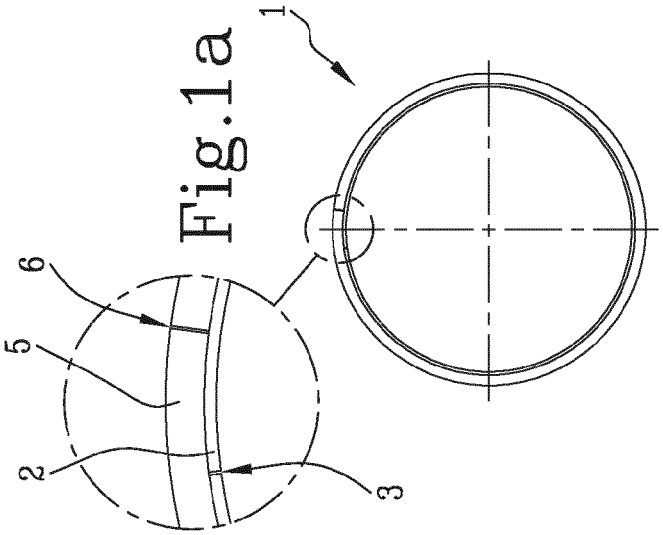


Fig.1a

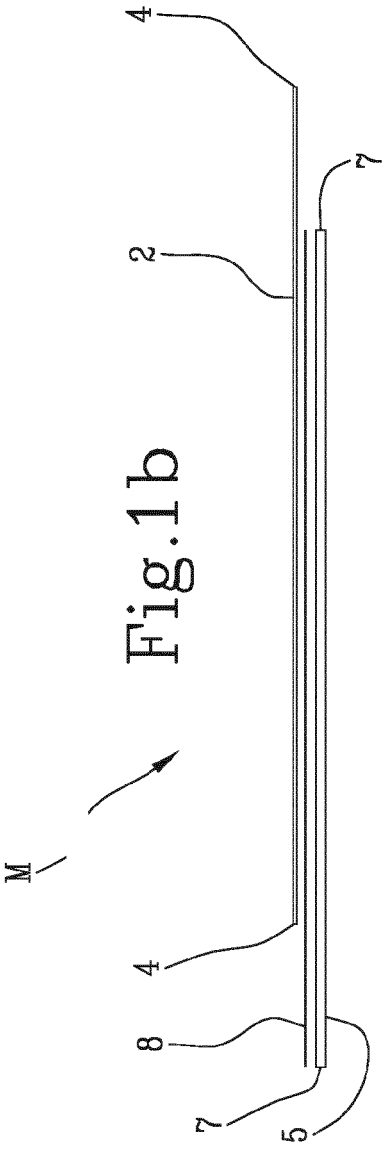


Fig.1b

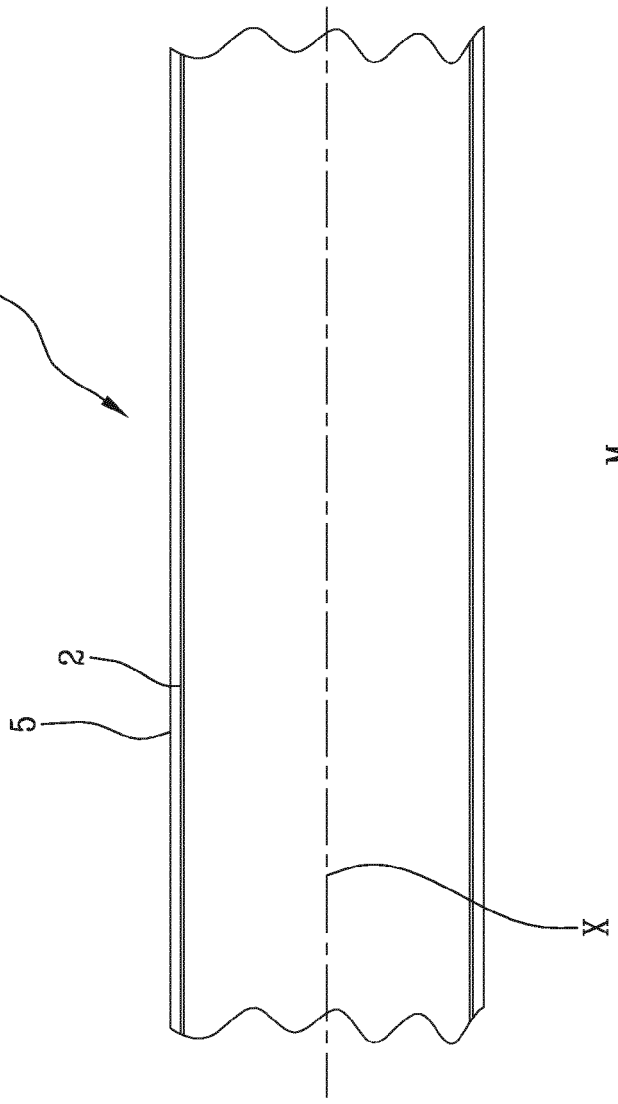


Fig.1c

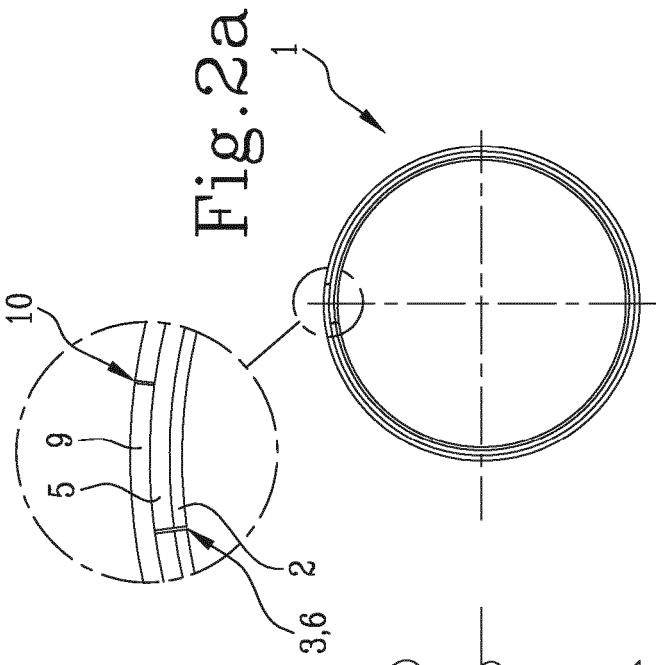


Fig.2a

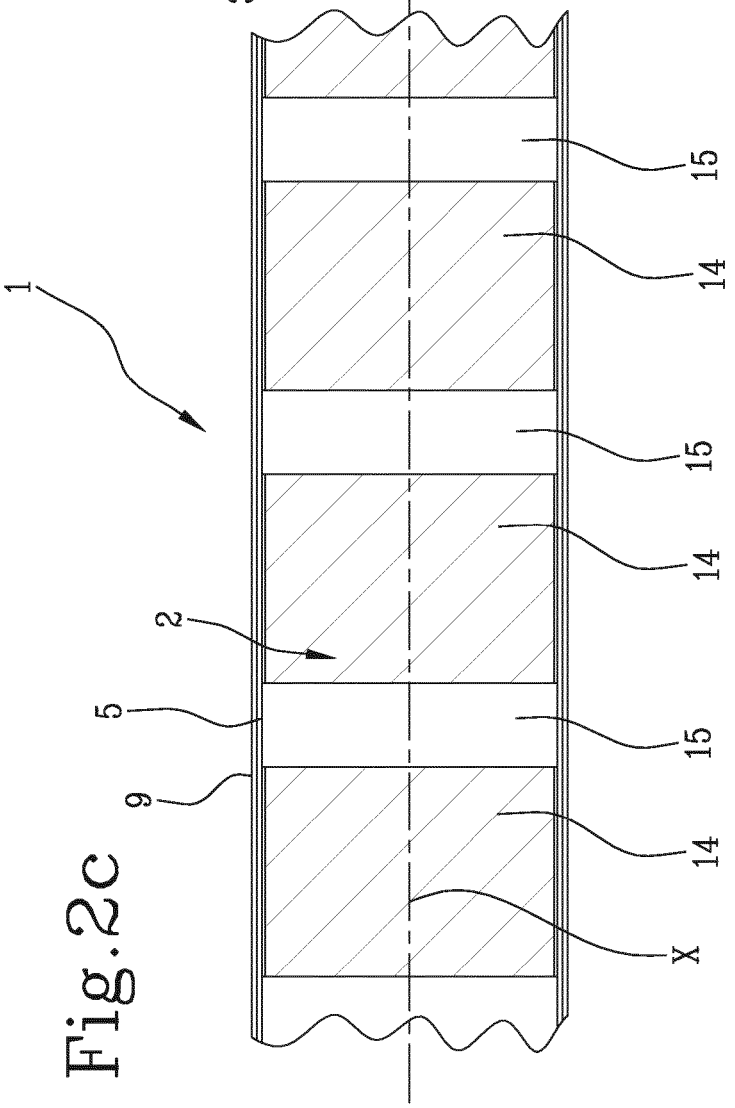


Fig.2c

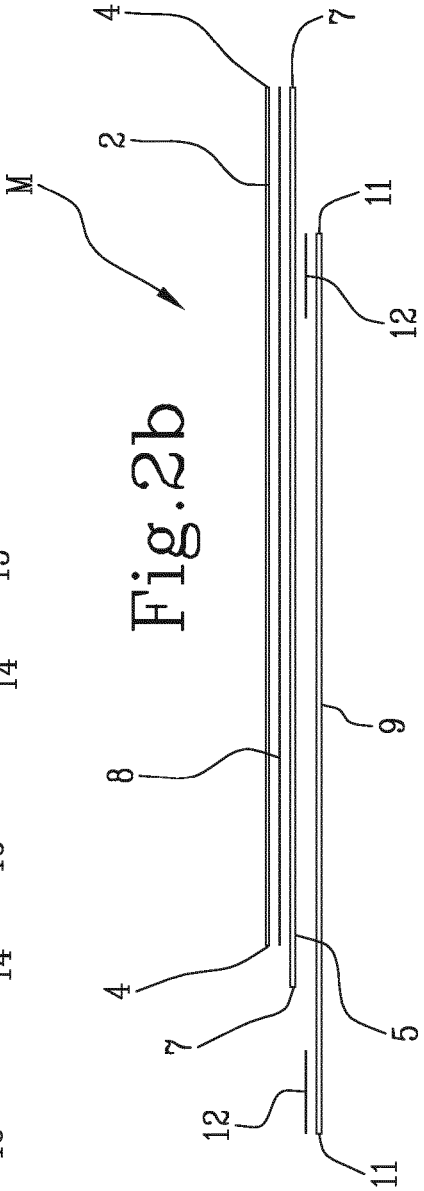


Fig.2b

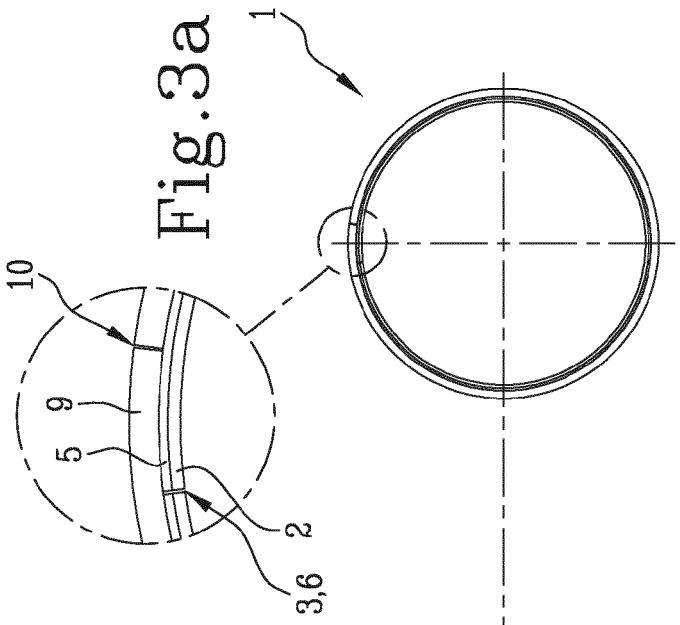


Fig.3a

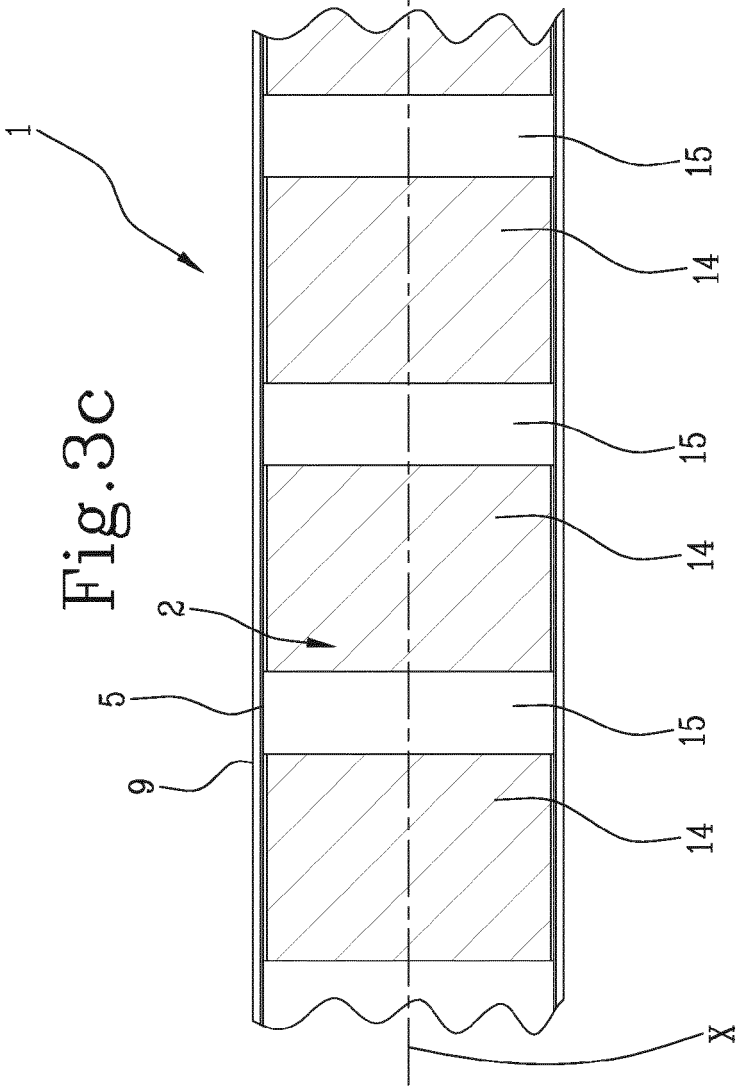


Fig.3c

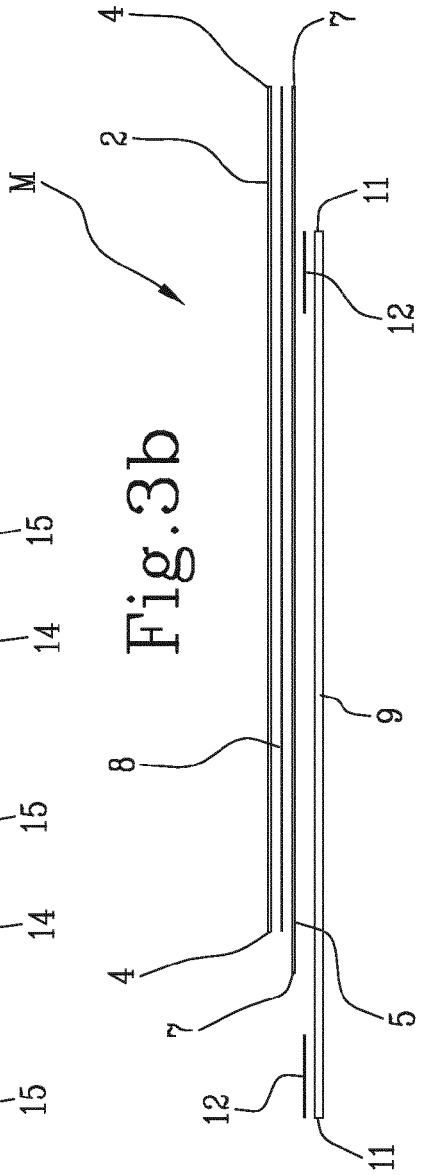


Fig.3b

Fig.4a

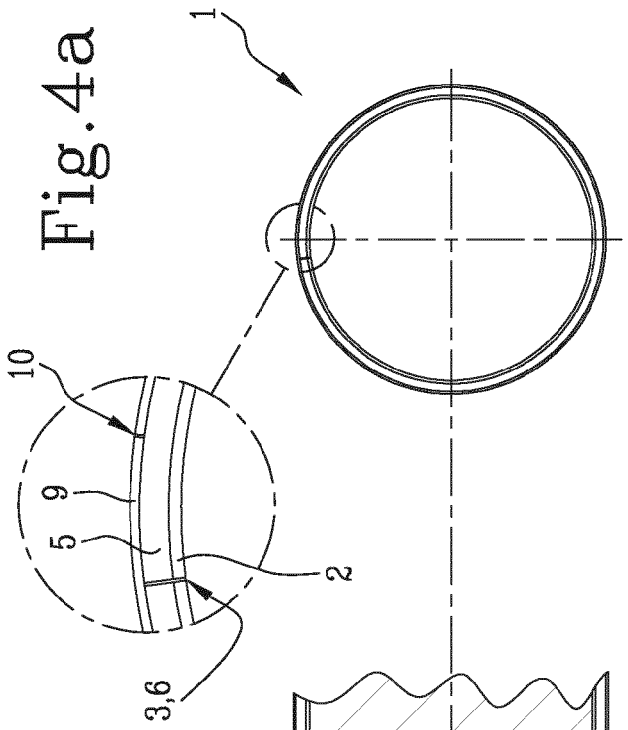


Fig.4b

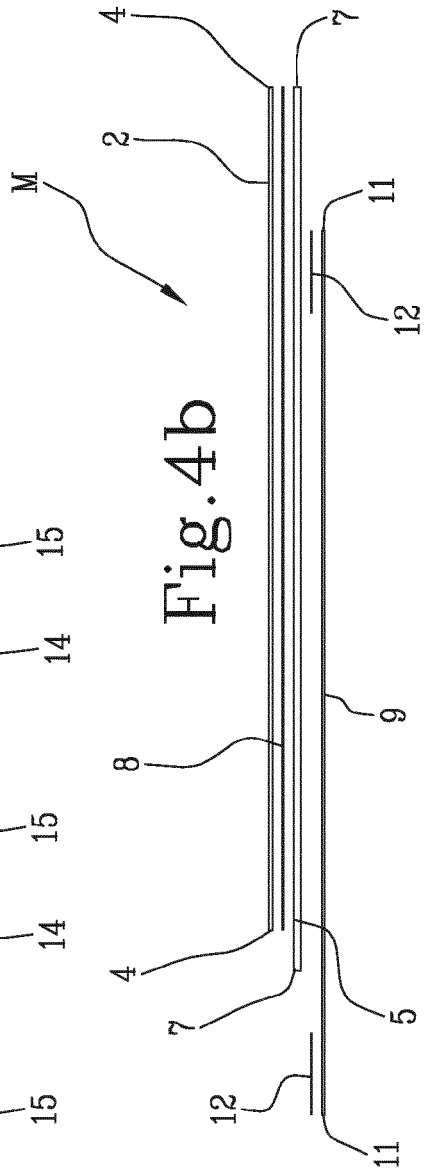
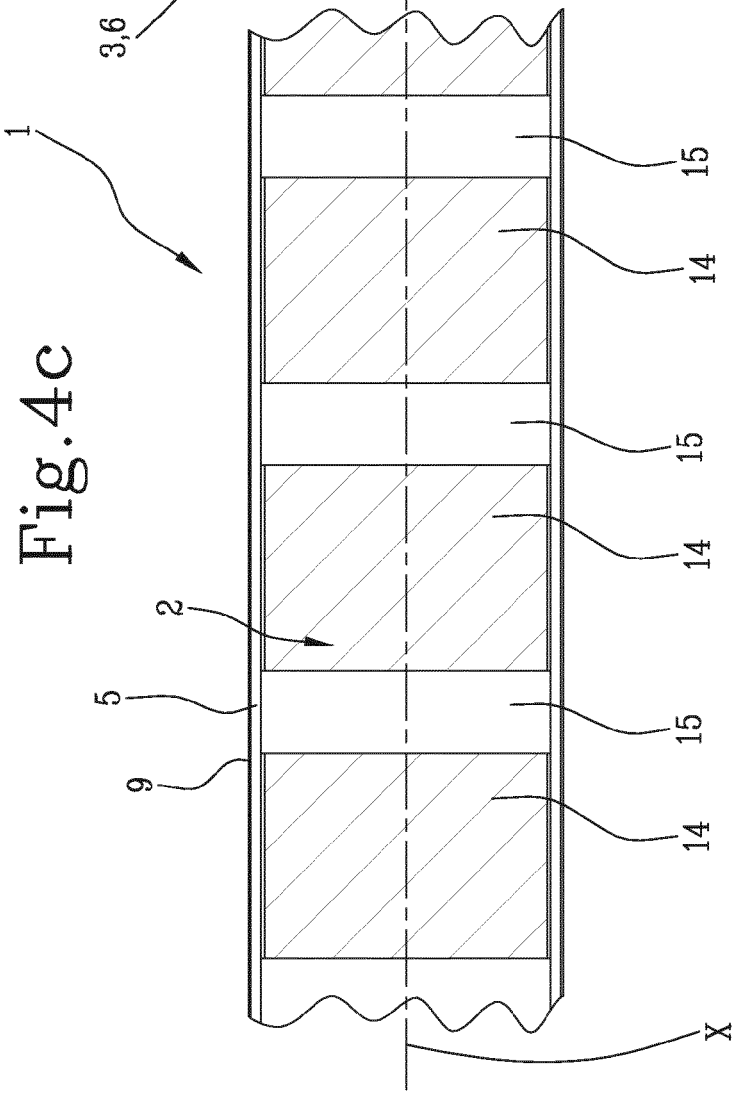


Fig.4c



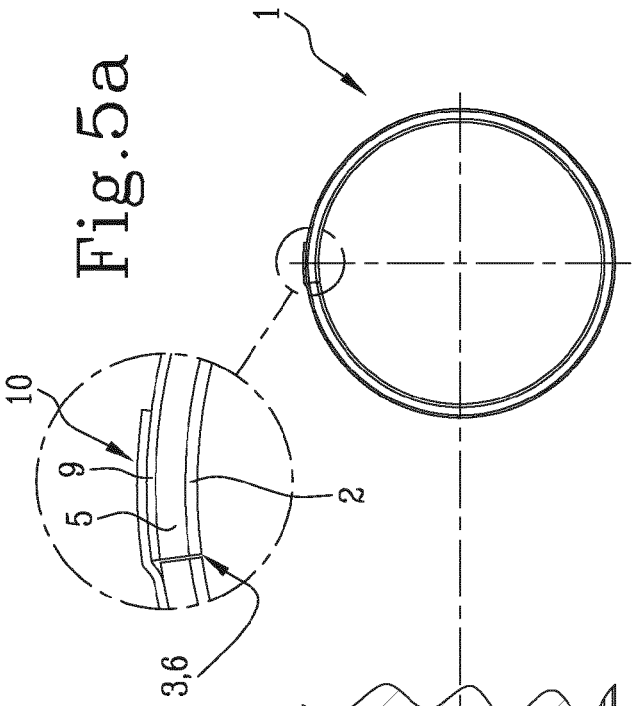


Fig.5a

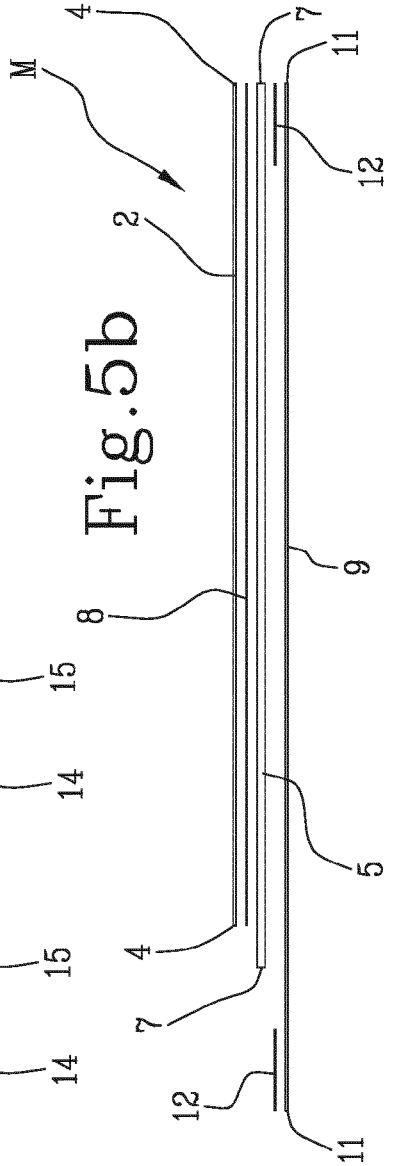


Fig.5b

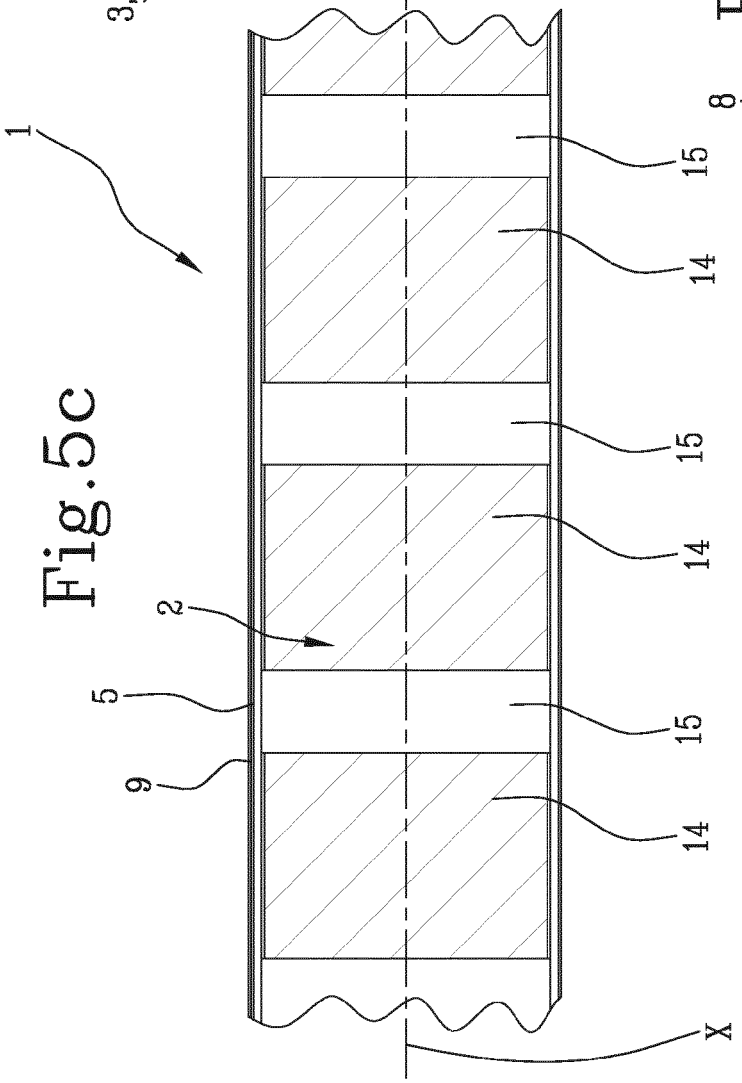


Fig.5c

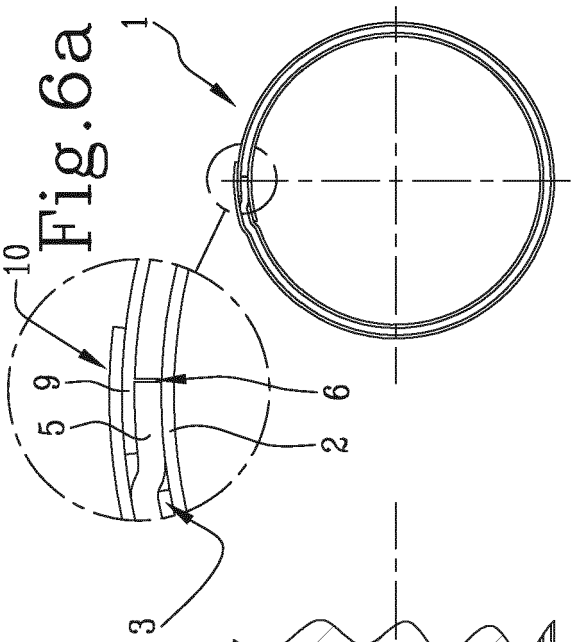


Fig.6a

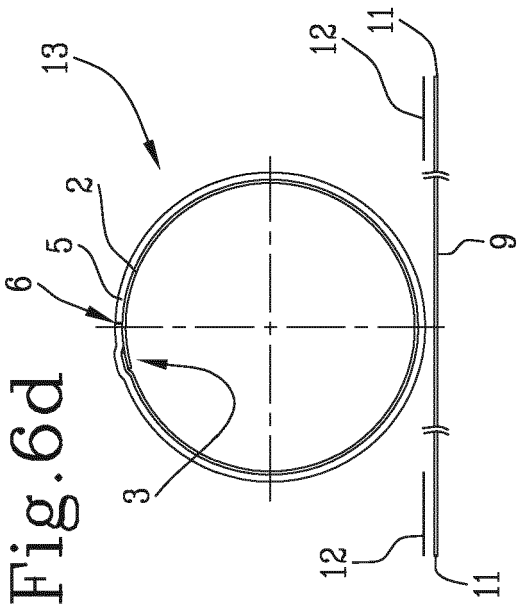


Fig.6d

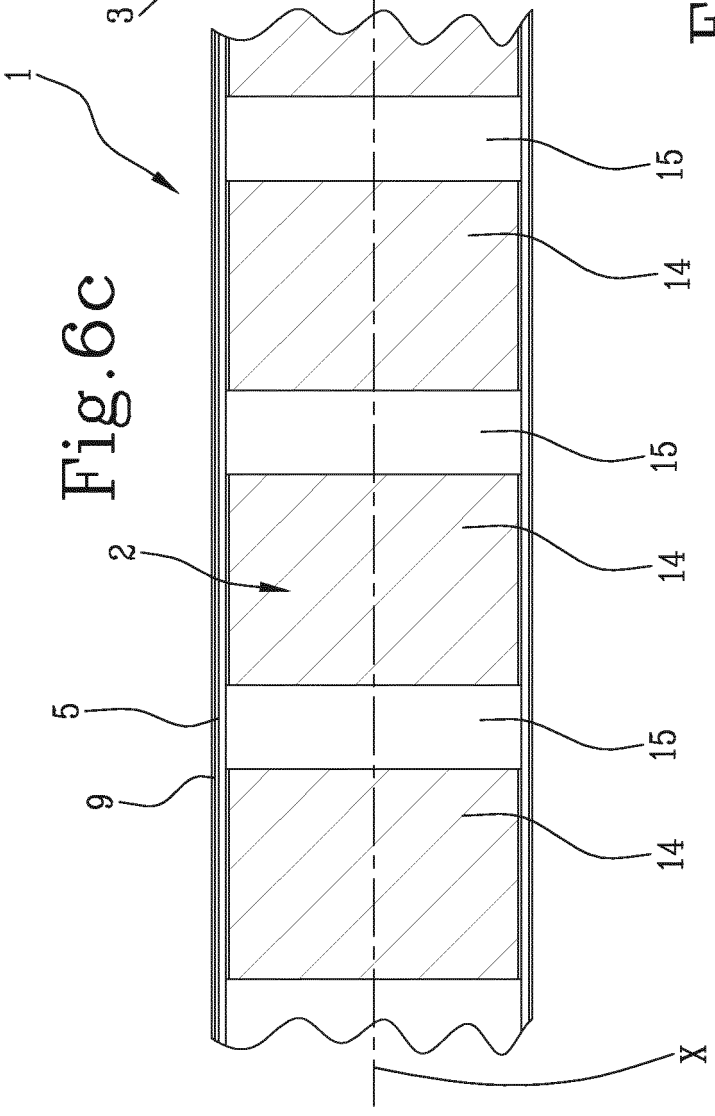


Fig.6c

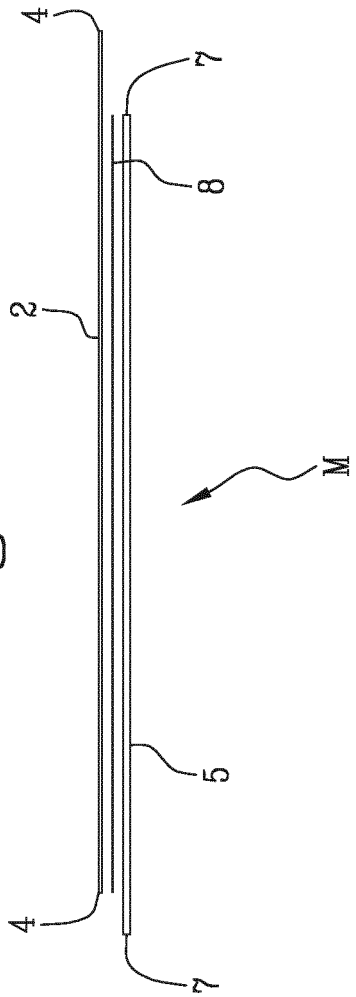


Fig.6b

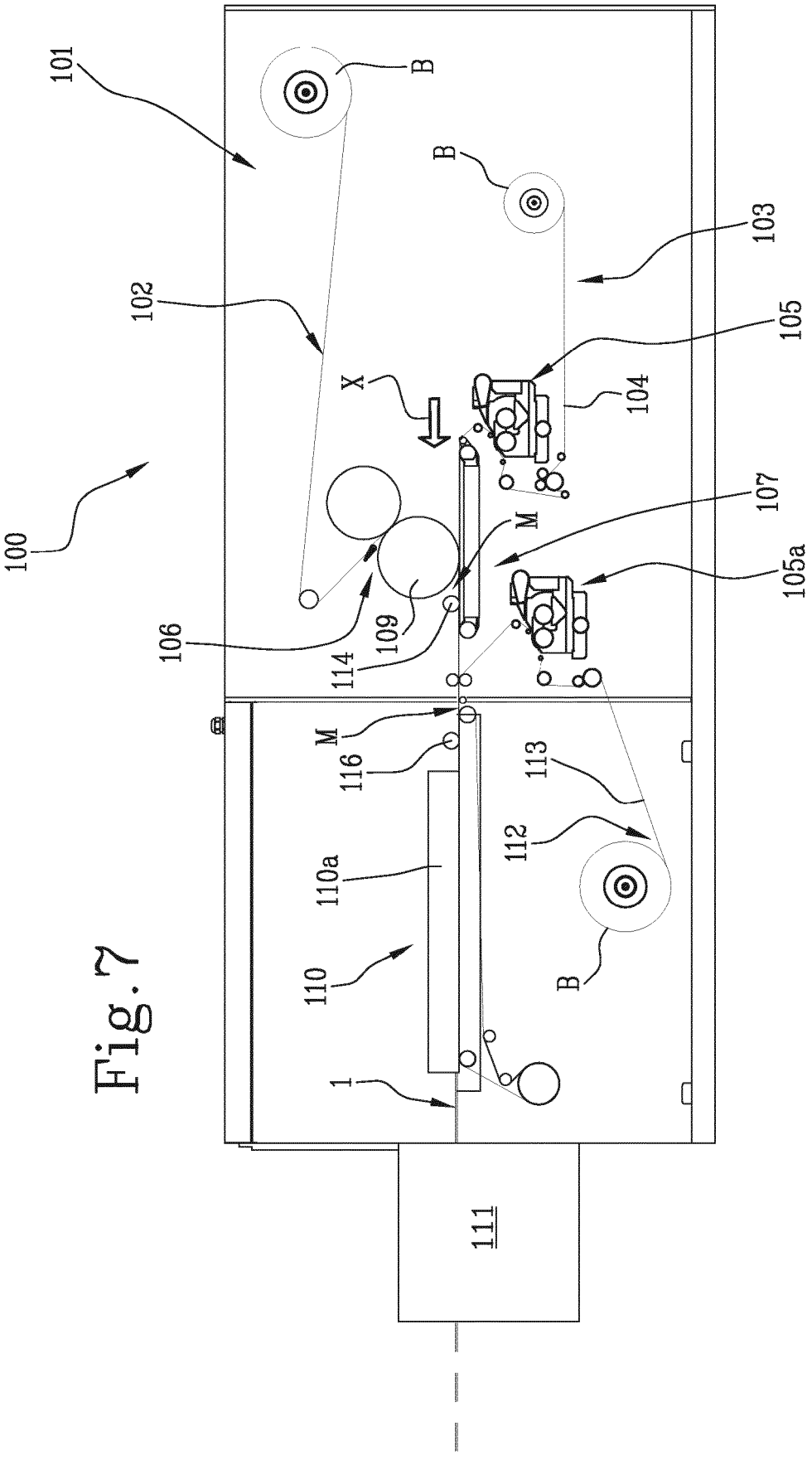

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Fig.7

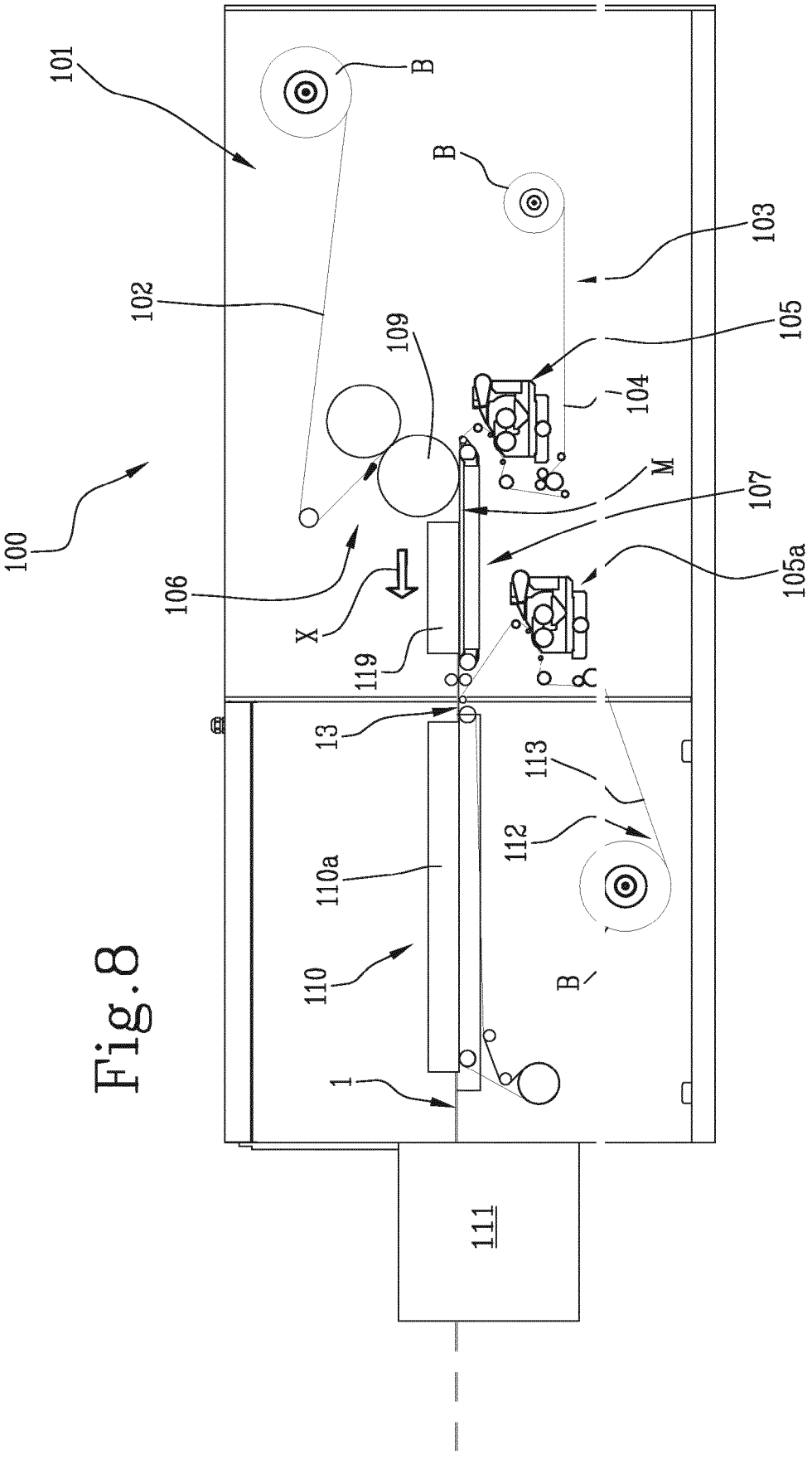
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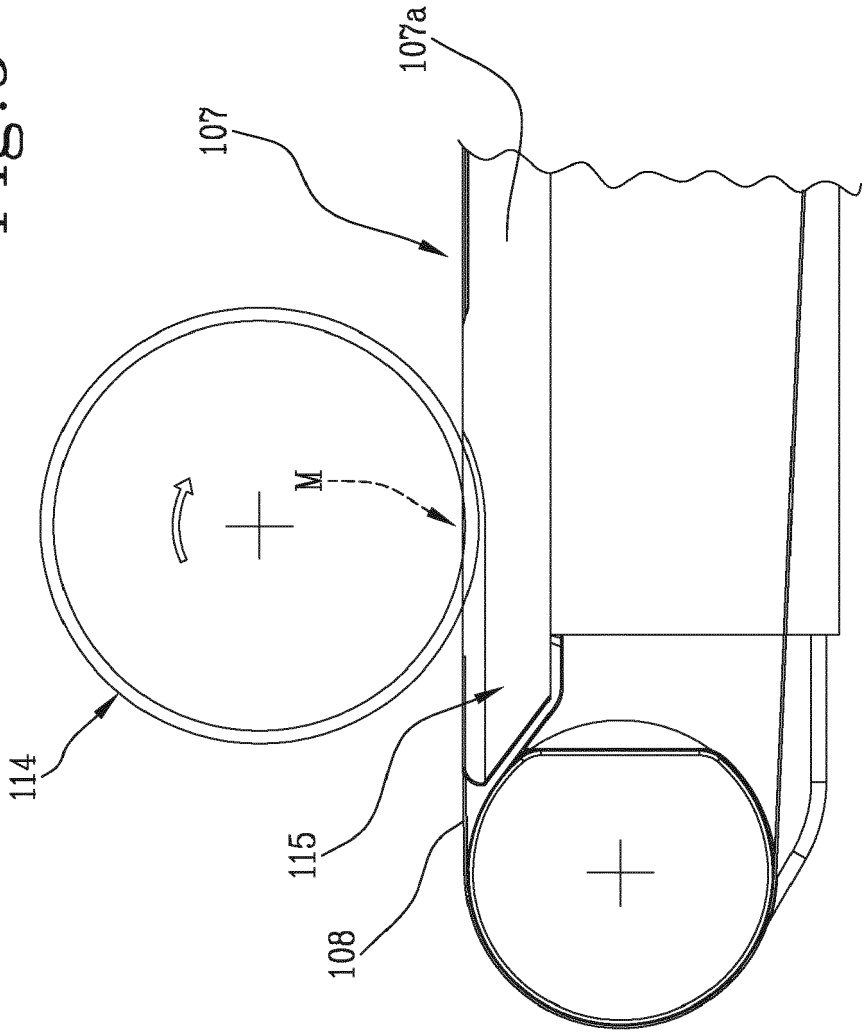
Fig.8

Fig.9



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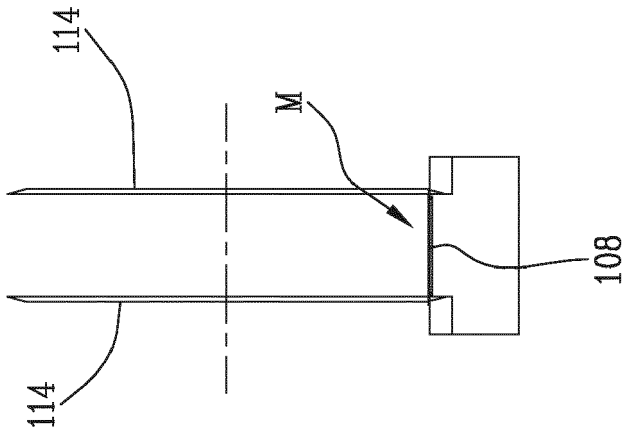


Fig.11

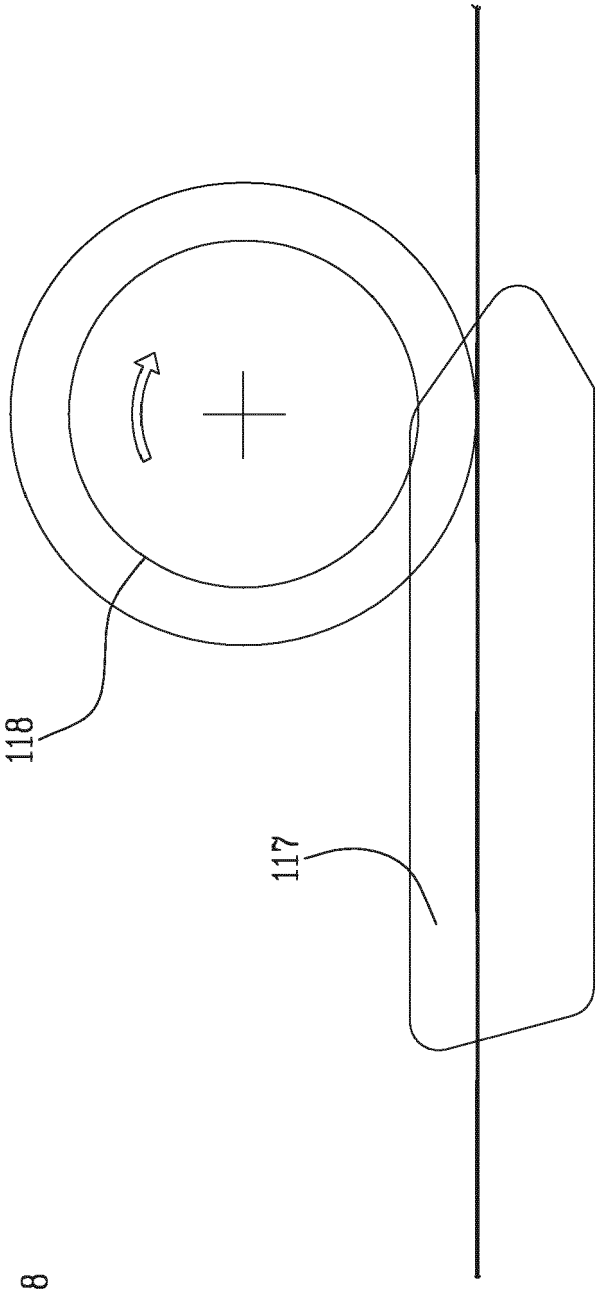
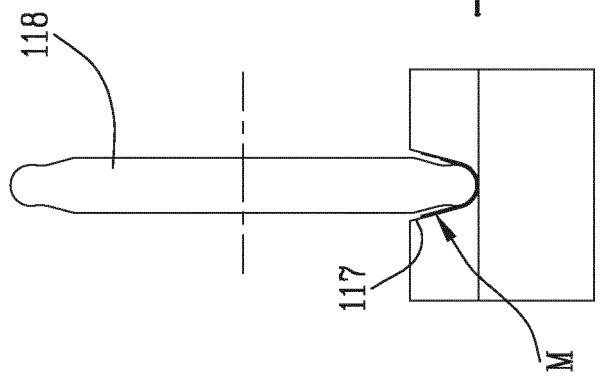


Fig.12



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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 7451

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y A	WO 2014/068703 A1 (JAPAN TOBACCO INC [JP]) 8 May 2014 (2014-05-08) * paragraph [0018] - paragraph [0022]; figures 6-8 *	1-6, 8-14,16 7,15	
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A24C
A24D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 April 2021	Caballero Martínez

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