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(54) **Pneumatic splicer unit for textile machines**

(57) Pneumatic splicer of the type comprising a splicing chamber (3) supplied from opposite sides with two tails (1"',2"') to be joined, for each of said tails (1"',2"') there being provided, arranged in a specular manner in relation to said splicing chamber (3), clamping means (6, 7) of the tails (1"',2"') positioned at one side of said chamber (3) as well as preparation means (4,5) and cutting means (8,9) positioned on the other side of said splicing chamber (3), characterized by the fact of comprising for each tail (1"',2"') means of selective retention and release (8',8",8"',9',9",9"') thereof positioned on the same side as said cutting means (8,9) in relation to the splicing chamber (3).

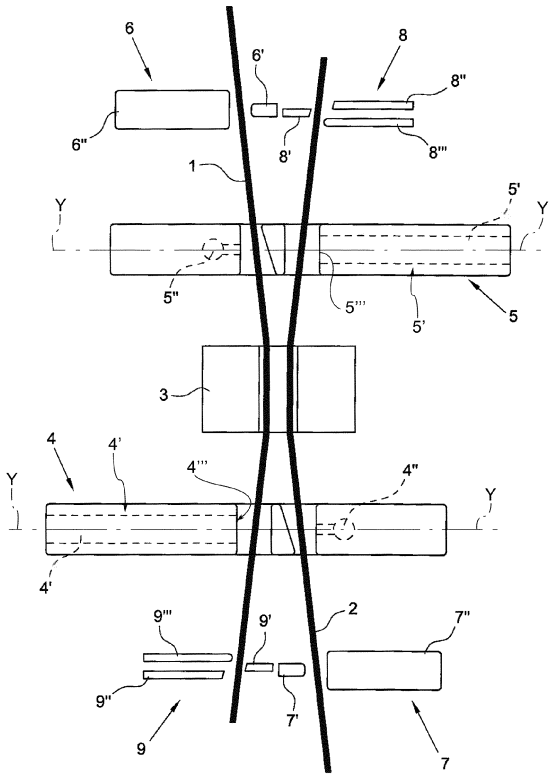


Fig. 1

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Description

[0001] The present invention relates to a pneumatic splicer unit for textile machines, in particular for winding machines.

[0002] Textile machines such as winding machines are known as being provided with numerous work stations in each of which splicer devices are installed to restore the continuity of the yarn.

[0003] In fact, the continuity of the yarn during unwinding from the feeding bobbing and winding onto the package can be interrupted as desired, for example ordering a cut of the yarn to eliminate a defect, or on account of a spontaneous rupture of said yarn.

[0004] Another interruption in the continuity of the winding occurs when the feeding bobbing is exhausted.

[0005] Devices of a mechanical type, known as knotting mechanisms were used as yarn-joiners in the past.

[0006] Today however these mechanical yarn-joiners have been replaced by yarn joiners of the pneumatic type, the present invention also falling within such category.

[0007] These appliances, commonly known as "splicers" are defined as pneumatic account of the fact that the joining of the ends of yarn to connect and join is performed without knotting by means of a special jet of air inside a splicing chamber which said ends to be joined are previously inserted.

[0008] Splicers of this type are widely known of in the prior art and are described for example in the patent US6170247 as well as in many other patent and non -patent documents.

[0009] The known method of the pneumatic splicers provides that the two yarns to be joined, coming in opposite directions from the feeding bobbing and the package, are first captured and manipulated by the packaging head, and then inserted in the splicer where, before the actual joining thereof, they are shortened to size at their respective opposite ends, forming tails.

[0010] These tails are first prepared eliminating the twist and making the fibres parallel, and then retracted so as to have the desired length of reciprocal overlap.

[0011] Only at this point are they finally joined in the splicing chamber by means of a jet of pressurized fluid.

[0012] More specifically, the ends of the yarn, guided by specific feeders not shown here and belonging to the prior art, are inserted in the splicer so that such free ends are arranged on opposite sides of the splicing chamber and each on the opposite side to its respective feeding bobbing or package.

[0013] In other words, the package yarn end comes to find itself under the splicing chamber and the feeding bobbing yarn end over the splicing chamber.

[0014] In such position the two yarns are clamped at a point so that the two free ends lie at a preparation nozzle.

[0015] The terminal part of the end, called the yarn tail, is then cut before being captured and transported inside the preparation device where air at a high flow rate and speed removes the twist at the cut end and makes the fibres parallel.

[0016] This way a tail with open fibres suitable for subsequent joining is obtained.

[0017] It is known today that improved preparation of the tail corresponds to an improved join.

[0018] The yarn tails thus prepared are then retracted by a known tail retraction device, so as to regulate the length inside the splicing chamber, and lastly transported inside the splicing chamber where a jet of fluid produces, by vorticity and flailing, a weaving of the fibres and generates the pneumatic join desired.

[0019] Depending on the type of splicer, the splicing chamber may be used as is or may also be closed with a cover.

[0020] Lastly, the splicer repositions itself at the starting point releasing the join made to the feeding bobbing head.

[0021] The pneumatic splicers described above thus contain the splicing chambers which the yarns to be joined are inserted in, the organs for clamping and cutting the tails, the organs for preparing the tails before being joined, organs for closing the covers of the chambers when present, organs for adjusting the length of the tails, organs for adjusting the jets of air in the preparation devices, organs for adjusting the jets of air in the splicing chamber, and release organs of the joined yarn.

[0022] The sequence of the operating steps, in brief, provides for:

[0023] 1. intercepting and inserting the feeding bobbing yarn and the package yarn in the splicing chamber, an operation performed entirely by the feeding bobbing head by means of the mouths and feeders or in other cases assisted by specific feeders of the splicer;

[0024] 2. closing the chamber cover (where present);

[0025] 3. clamping and cutting the tails;

[0026] 4. pneumatic preparation of the tails;

[0027] 5. retracting the tails;

[0028] 6. blowing in the splicing chamber;

[0029] 7. releasing the yarn and returning the device to the start position.

[0030] It is to be noted that to achieve good joins it is important that the tails, at the moment of their presentation before the preparation devices, are the same length so that once inserted therein and subjected to the strong flow of air they are prepared optimally in a repeatable and even manner.

[0031] To such purpose a control function of the tail is used at the moment of cutting, which is not described inasmuch as normal and which takes place between step 3 and step 4.

[0032] In fact, in the absence of such function, after cutting the tail would tend to position itself inadequately for its subsequent preparation, on account of the nature of the yarn, of its liveliness, or the fact that the yarn may contain an elastomer; for example in yarns having an S or Z twist the cut tail may in the first case move in one direction, in the second in the opposite direction and in

the case of yarns having an elastomer core inside them added to this effect is the uncontrolled elastic shortening effect.

[0033] Preparation of the tails is conducted by setting a blowing time of the preparation devices, normally lasting 50 to 500 thousandths of a second; the initial part of such time is used to capture the tail, the remaining part of the time to prepare said tail, for de-twisting and making the fibres parallel. It is clearly important for the time spent capturing the tail to be, not only as short as possible, but also even and homogeneous between the two preparation devices, and to achieve this the tail must always present in the same manner before the preparation device so as to make the capturing time limited, even and homogeneous.

[0034] The presence of the tail control function in fact prevents the tail, once cut, from positioning itself inadequately in front of the preparation device, with the risk of determining irregular capturing and an imperfect preparation thereof, which then results in an imperfect join or even in a joining error.

[0035] The various devices available on the market achieve this function in terms of construction, differing only by slight variations.

[0036] This may in fact be achieved with pressurized or suction air or mechanically by providing labyrinths.

[0037] The pneumatic function is generally provided by the preparation devices, which in a first step are powered at a lower flow rate; this flow of air at a low rate is used to control the tail before cutting, making it assume a definite position so that as soon as cut it presents itself adequately to the preparation device.

[0038] The flow rate must be low so as not to risk creating random lengthening of the section of yarn between the splicing chamber and the cutting organs, which would cause unevenness of preparation between the tails.

[0039] When the preparation device is then powered at a high flow rate, the tail already present before it is captured and transported therein by the strong flow of air generated; once inserted, the flow of air de-twists the end and makes the fibres parallel.

[0040] The low pressure pneumatic jet for the control of the tail, called pre-blowing by some, thus provides a control method of the tails commonly used in that it exploits the preparation organs already present in the splicers, powering them with a low flow rate.

[0041] The efficiency thereof is however related to the type of yarn to be treated.

[0042] Moreover, in the splicers in which the flow of air is supplied by solenoid valves and which normally function open or closed, the additional difficulty is precisely that of achieving a lower flow rate.

[0043] Mechanical labyrinths are simple to make but have the disadvantage of not being equally effective as the gauge and twist of the yarn varies. To overcome this drawback they could be regulated or changed depending on the yarn but this would entail overly expensive operating costs.

[0044] The problem to resolve is therefore in general that of providing an alternative control of the tail between cutting and preparation where such control is in addition more secure than that achievable using a pneumatic or mechanical labyrinth method as described above.

[0045] It will be evident how the solution proposed is particularly simple, economical and particularly functional.

[0046] These purposes according to the present invention are achieved by making a pneumatic splicer as disclosed in claim 1.

[0047] The processing steps will then be specified in the more general embodiment in claim 5.

[0048] Further characteristics of the invention are shown in the dependent claims.

[0049] The characteristics and advantages of a pneumatic splicer according to the present invention will be more clearly evident from the description below, made by way of a non-limiting example with reference to the appended schematic drawings.

[0050] In extreme synthesis the solution proposed by the present invention consists of treating the tail as soon as cut for a brief period specifically at the point of the cut to then release it so that it is immediately caught and prepared by the preparation device.

[0051] In other words after cutting, the two ends of the yarn are constrained in two points upstream and downstream of the splicing chamber.

[0052] To such purpose, on one side of the chamber normal clamps are used while on the opposite side means able to retain the freshly cut tails to better guide their advancement towards the preparation device have been inserted in the pneumatic splicer.

[0053] In particular a scissor has been introduced configured so as not just to cut but also to retain the freshly cut tail so that it is not free to move and thereby not subject to uncontrolled movements caused by the type, liveliness ad twist of the yarn.

[0054] Advantageously this further ability of the scissor is independent of the type of tail cut, its gauge, type, liveliness, twist, addition of elastomer and always releases it only at the right moment.

[0055] The right moment is when the preparation devices are already at full rate and thus the capturing and transport of the tail inside the preparation device is performed with maximum efficiency.

[0056] According to the example shown in the figures, the scissor with tail retention function comprises a mobile blade, a fixed blade and a contrast organ.

[0057] In particular, such three elements are arranged in relation to each other so that during cutting they are pressed together by an elastic force, for example exerted on the fixed blade or on the contrast organ.

[0058] This way, the mobile blade, entering between the contrast organ and the fixed blade is pressed slightly so that the yarn is cut as the mobile blade continues its stroke and at least partially elastically trapped between the non-cutting side of the mobile blade and the contrast

organ.

[0059] As the blade retracts the tail is then released, the aforementioned pressing force being removed.

[0060] The process described above is schematically shown in figures 1 to 6 which show the new operating sequence provided for by the splicer according to the present invention.

[0061] 1. interception and insertion of the feeding bobbing yarn and package yarn in the splicer;

[0062] 2. closing of the chamber cover (optional);

[0063] 3. clamping of the yarns, retention and cutting of the tail, innovatively the tail is not left free;

[0064] 4. powering of the preparation devices at full rate;

[0065] 5. opening of the scissor and consequent release of the tail;

[0066] 6. immediate insertion of the tail in the preparation device and processing thereof ;

[0067] 7. retraction of the tails;

[0068] 8. blowing in the chamber;

[0069] 9. release of the yarn and return to the start position.

[0070] With reference to figures 1 to 9 and to the reference numerals indicated therein, the functioning of the splicer according to the present invention is extremely simple to understand.

[0071] Figure 1 shows the arrangement of the package yarn 1 and the feeding bobbing yarn 2 just introduced into the splicer.

[0072] The package yarn 1 is manipulated from above and brought downwards beyond the splicing chamber.

[0073] Conversely, the feeding bobbing yarn 2 is manipulated upwards beyond the splicing chamber.

[0074] The drawings also show the splicing chamber 3, the preparation devices 4 and 5, with relative preparation tubes 4' and 5' and the nozzles for the jet of fluid 4" and 5".

[0075] The clamp 6 of the package yarn 1 is also shown with the mobile lever 6' and the block 6", and the clamp 7 of the feeding bobbing yarn 2 with the mobile lever 7' and block 7".

[0076] Lastly the innovative scissor 9 of the package yarn 1 fitted with the relative mobile blade 9', contrast organ 9"' and fixed blade 9", is shown.

[0077] Similarly, the scissor 8 of the feeding bobbing yarn 2 is fitted with the relative mobile blade 8', contrast organ 8"' and fixed blade 8".

[0078] In figure 1 all the splicer elements are shown in the rest position and are not operated.

[0079] Figure 2 shows the arrangement of the yarn 1 and 2 just after the clamping operation by the corresponding clamps 6 and 7. The clamping of the yarns 1 and 2 is performed by closing the mobile levers 6' and 7' against the fixed blocks 6" and 7".

[0080] Figure 3 shows the arrangement of the clamped yarns when the tail cutting and retention step begins. The package yarn 1 is clamped by the clamp 6 on the upper side and on the lower side is retained between the mobile blade 9' of the scissor 9 which partially straddles the contrast organ 9"' imprisoning the end 1' of the yarn 1.

[0081] Similarly, the feeding bobbing yarn 2 is clamped by the clamp 7 on the lower side and on the upper side is retained between the mobile blade 8' of the scissor 8 which partially straddles the contrast organ 8"' imprisoning the end 2' of the yarn 2.

[0082] Figure 4 shows the subsequent step in which the scissors 8 and 9 have completed their stroke. The mobile blades 9' and 8' overlap the fixed blades 9" and 8" cutting the yarns just after the retention sections 1' and 2' The section of yarn 1' and 2' remain retained respectively between the mobile blades 9' and 8' and the contrast organs 9"' and 8"'.

[0083] The sections of yarn 1" and 2" cut by the scissors 9 and 8 are removed by suction nozzles in themselves known and not shown here.

[0084] Two tails are thus formed 1"' and 2"', comprised between the retention sections 1' and 2' and the splicing chamber 3.

[0085] Figure 5 show the arrangement of the yarns as soon as the preparation devices are fed with the high flow rate of fluid. The nozzles 4" and 5" of the preparation devices 4 and 5 emit two jets of high pressure fluid which enter the preparation tubes 4' and 5'.

[0086] The preparation means 4,5 comprise preparation tubes 4',5' fluidically connected with preparation nozzles 4",5", wherein the nozzles 4",5" emit jets of fluid which enter the preparation tubes 4',5'.

[0087] The tails 1"' and 2"' thus come to face the entrance of the respective tubes 4' and 5' so as to position themselves adequately for their subsequent capture by the tube 4' and 5' at the moment of release of the point 1' and 2' retained between the blades 9' and 8' and the respective contrast organs 9"' and 8"'.

[0088] In particular, a portion of yarn comprised between the tail 1"',2"' and the splicing chamber 3 crosses the preparation means 4,5 in order to be directly influenced by the jets of the preparation nozzles 4",5".

[0089] The portion of yarn crossing the preparation means 4,5 is comprised between the preparation nozzle 4",5" and the preparation tubes 4',5', so as to being directly influenced by the flow of the preparation nozzle 4",5" and forced to enter into said preparation tube 4',5' under the thrust of said flow, before releasing the tails 1"',2"'.

[0090] According to an embodiment, the preparation nozzles 4",5" are aligned with an inlet port 4"',5"' of the preparation tubes 4',5', in order to directly send the jets of fluid into the preparation tubes 4',5' and directly force the yarn to enter said preparation tubes 4',5'.

[0091] According to an embodiment, the preparation tube 4',5' has a prevalent transversal direction Y-Y which is parallel to the main direction of the jets generated by said preparation nozzles 4",5".

[0092] Figure 6 shows the arrangement of the yarns 1"' and 2"' just after their release by the mobile blades 9' and 8' which move backwards releasing the points pre-

viously retained 1' and 2'.

[0093] The tails 1"' and 2"' are shown by a continuous line, letter a, an instant before their release, and by a dotted line, letter b, the same tails 1"' and 2"' are shown inserted in the preparation tubes 4' and 5' subject to the flow of fluid used for their preparation.

[0094] Figure 7 show the tails 1"' and 2"' with respective ends 1"" and 2"" prepared by the preparation devices 4 and 5 without twist and with the fibres parallel, once withdrawn towards the splicing chamber 3 by the desired length.

[0095] Two mobile levers 10 and 11 are used to distend the yarns 1 and 2 deviating their path in a known manner, so that the respective tails 1"' and 2"' return by a predetermined length towards the splicing chamber 3.

[0096] Figure 8 shows the tails 1"' and 2"' after their encompassing in the join 12 of the yarns 1 and 2 which is achieved by injecting pressurized fluid into the splicing chamber 3, using the known method.

[0097] Figure 9 shows the last step, in which the mobile levers 6' and 7' free the two sections of yarn 1 and 2 now joined by the join 12 from the blocks 6" and 7" of the clamps 6 and 7.

[0098] The splicer is once again in the rest position and the joined yarn can be extracted to resume the winding operation.

[0099] It is thus evident how the pneumatic splicer according to the present invention achieves the purposes highlighted above.

[0100] In fact, the pneumatic splicer according to the present invention represents an alternative solution to the known splicers relative to the problem of controlling the freshly cut tails as the type of yarn varies.

[0101] The pneumatic splicer of the present invention thus conceived is susceptible to numerous modifications and variations, all falling within the same inventive concept; moreover, all the parts may be replaced with technically equivalent elements. In practice, the materials used, as indeed their dimensions, may be varied as needed according to technical requirements.

Claims

1. Pneumatic splicer of the type comprising a splicing chamber (3) supplied from opposite sides with two tails (1"',2"') to be joined, for each of said tails (1"',2"') there being provided, arranged in a specular manner in relation to said splicing chamber (3), clamping means (6,7) of the tails positioned at one side of said splicing chamber (3) as well as preparation means (4,5) and cutting means (8,9) positioned on the other side of said splicing chamber (3), **characterized by** the fact of comprising for each tail (1"',2"'), means of selective retention and release (8',8",8"',9',9",9"') thereof positioned on the same side as said cutting means (8,9) in relation to the splicing chamber (3), wherein said means of selective retention and release (8',8",8"',9',9",9"') of the tail are configured so as to co-operate with said cutting means (8, 9) so as to begin to retain said tail (1"',2"') before cutting and to release it after starting the dispensing of pressurized air in the preparation tubes (4,4',5,5') of the tail (1"',2"') .

2. Splicer according to claim 1, wherein said cutting means (8,9) comprise a mobile blade (8',9') and a fixed blade (8",9"), said selective retention and release means of the tail comprise a contrast (8"',9"'), said blades (8',8",9',9") and said contrast (8"',9"') being positioned in relation to each other so that said mobile blade (8',9') slides between said fixed blade (8",9") and said contrast (8"',9"') and that the retention of the tail (1"',2"') begins during the advancement of said mobile blade (8',9') before cutting and that the release begins after starting the dispensing of pressurized air in the preparation tubes (4,4',5,5') of the tail (1"',2"').

3. Splicer according to claim 2, wherein the fixed blade (8",9") is sprung and said contrast (8"',9"') is fixed in a position such as to press the yarn against the advancing mobile blade (8',9').

4. Splicer according to claim 2, wherein the fixed blade (8",9") is not sprung and said contrast (8"',9"') is sprung.

5. Splicer according to any of the previous claims, wherein, the preparation means (4,5) comprise preparation tubes (4',5') fluidically connected with preparation nozzles (4",5"), the nozzles (4",5") emitting jets of fluid which enter the preparation tubes (4',5'), wherein a portion of yarn comprised between the tail (1"',2"') and the splicing chamber (3) crosses the preparation means (4,5) in order to be directly influenced by the jets of the preparation nozzles (4",5").

6. Splicer according to claim 5, wherein the portion of yarn crossing the preparation means (4,5) is comprised between the preparation nozzle (4",5") and the preparation tubes (4',5'), so as to being directly influenced by the flow of the preparation nozzle (4",5") and forced to enter into said preparation tube (4',5') under the thrust of said flow, before releasing the tails (1"',2"').

7. Splicer according to claim 5 or 6, wherein the preparation nozzles (4",5") are aligned with an inlet port of the preparation tubes (4',5'), in order to directly send the jets of fluid into the preparation tubes (4',5') and directly force the yarn to enter said preparation tubes (4',5').

8. Splicer according to claim 5, 6 or 7, wherein the preparation tube (4',5') has a prevalent transversal direc-

tion (Y-Y) which is parallel to the main direction of the jets generated by said preparation nozzles (4",5").

9. Method of joining yarn tails (1"',2"') comprising the following manipulation steps of the tails (1"'2"'):

a) intercepting and inserting said tails in a splicing chamber (3) so that they at least partially go beyond it;
b) clamping said yarns on the side opposite said tails (1"',2"') in relation to the said splicing chamber (3),
c) cutting the tails (1"',2"');
d) preparing the tails (1"',2"');
e) inserting the tails (1"',2"') in preparation chamber (3);
f) freeing the clamps;
characterized by the fact of also comprising the step of retaining said tails (1"',2"') at the cutting zone, wherein the step of preparing the tails comprises the step of dispensing pressurized air in tubes positioned between said splicing chamber (3) and said cutting zone, said step of dispensing pressurized air starting before the release of said tails (1"',2"').

10. Method according to claim 9, wherein that said step of retaining said tails at the cutting zone starts before and terminates after cutting of the tail.

11. Method according to any one of claims 9 to 10, wherein said step of retaining said tails at the cutting zone is performed by pressing the tails against the cutting organs.

12. Method according to any one of claims 9 to 11, wherein said step of retaining said tails at the cutting zone is performed by elastically pressing the tails against the cutting organs.

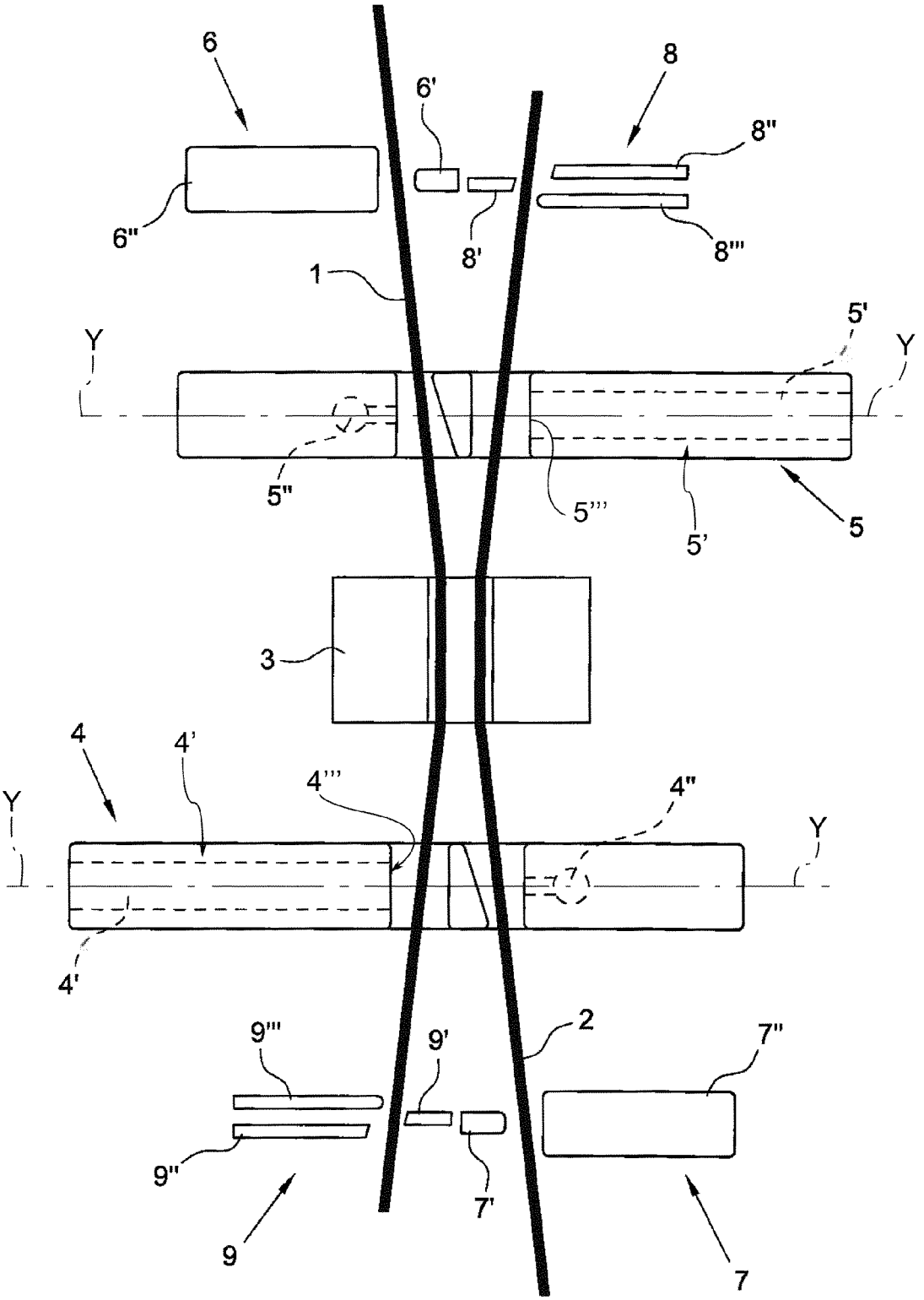


Fig. 1

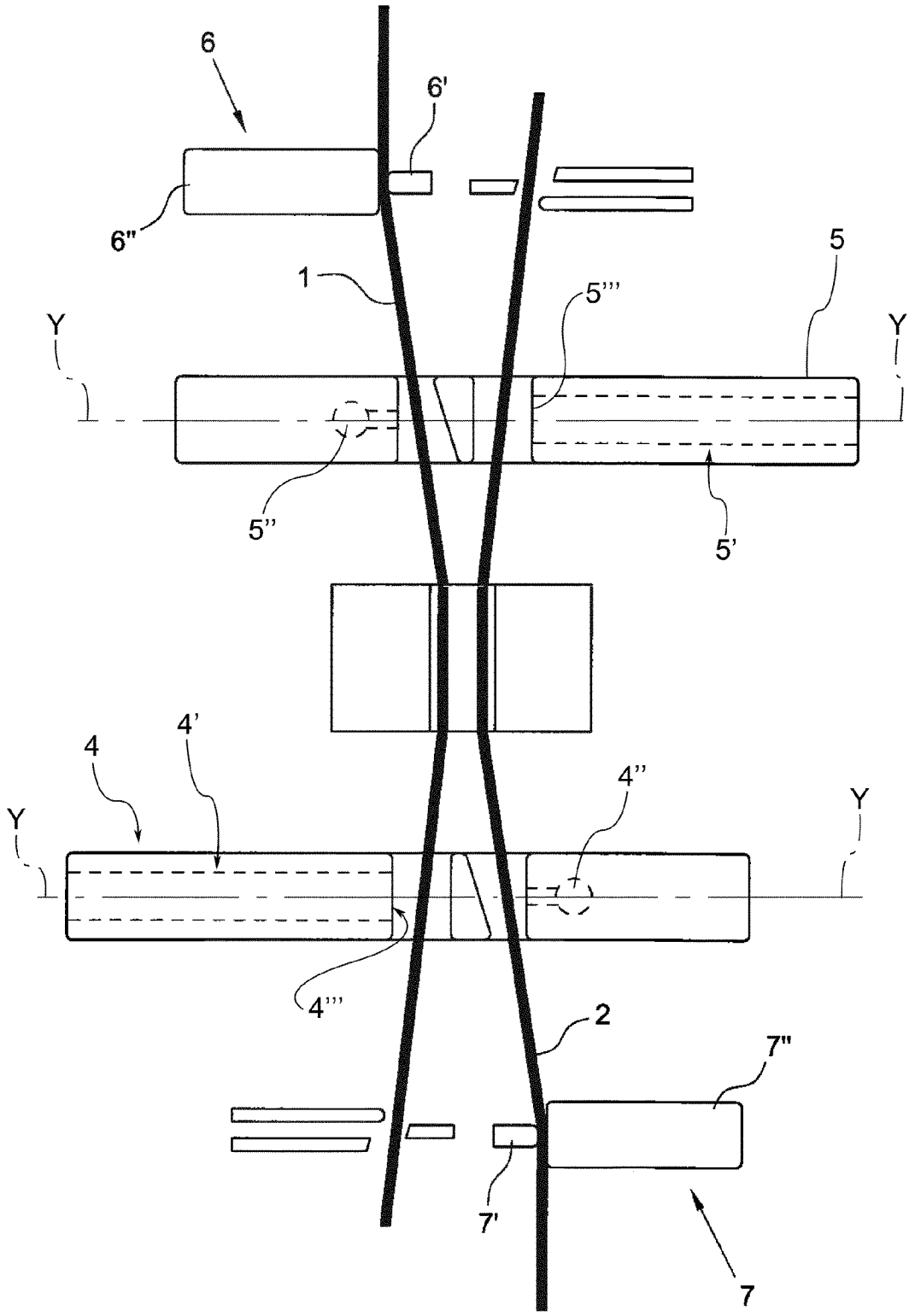


Fig. 2

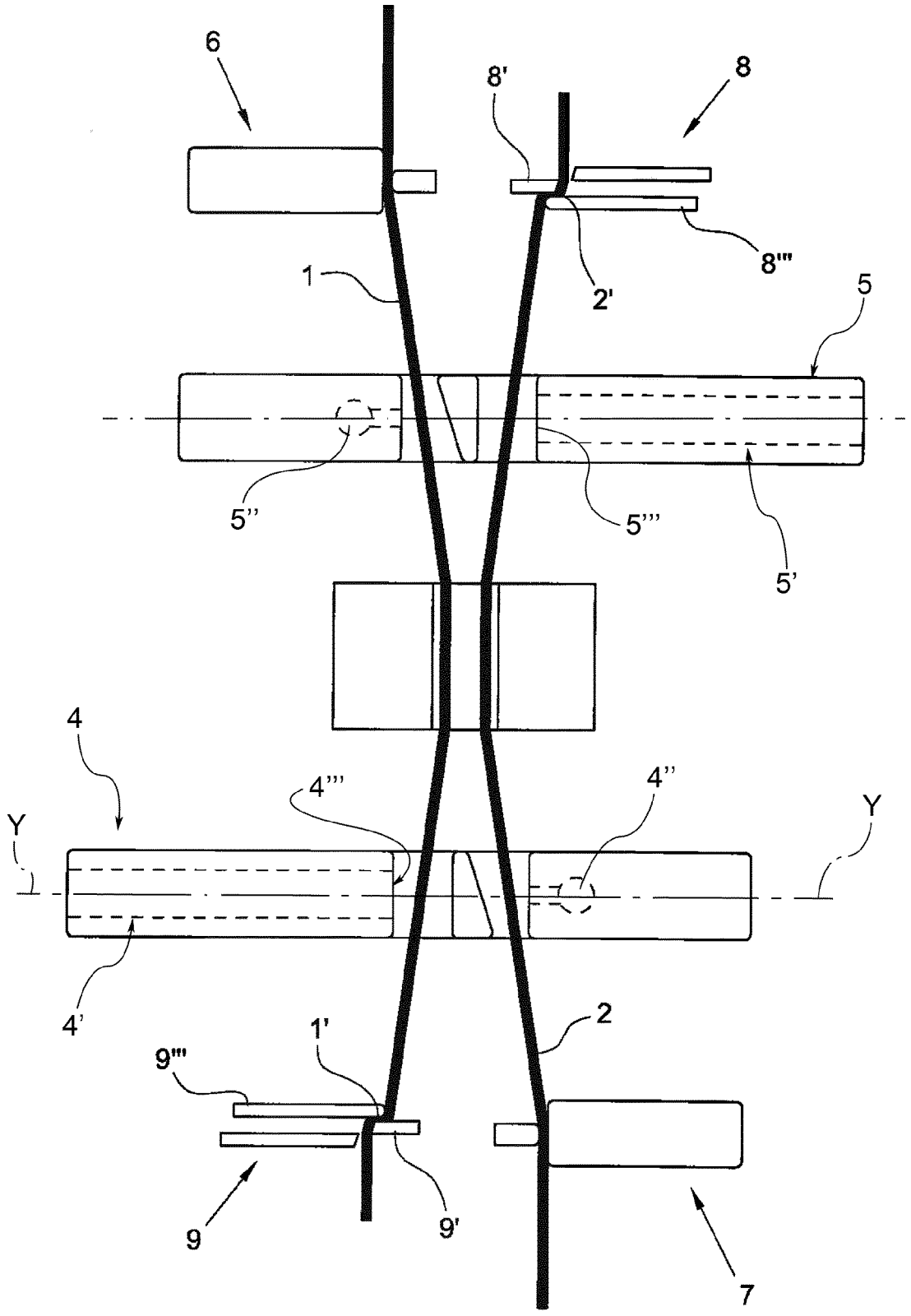


Fig. 3

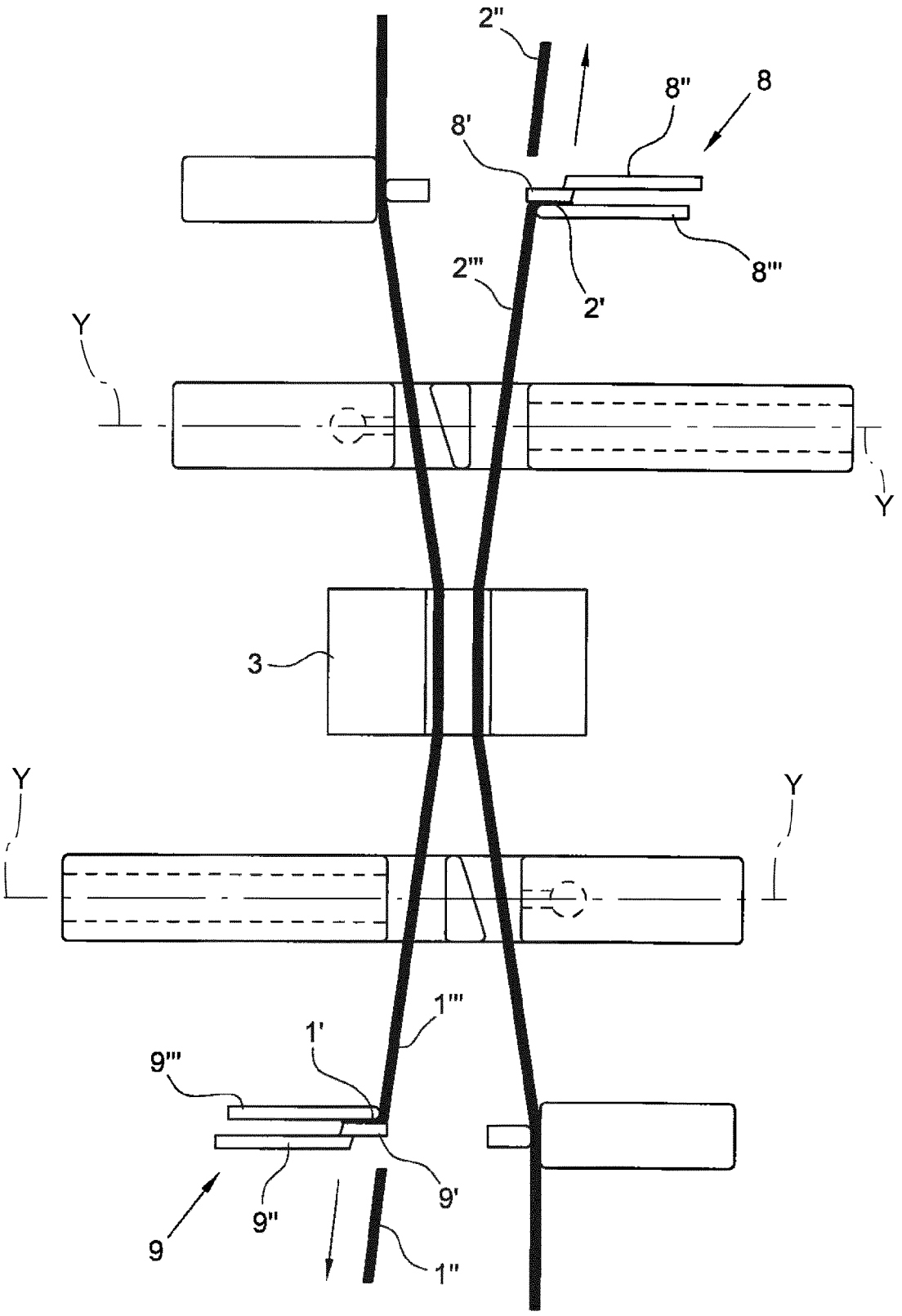


Fig. 4

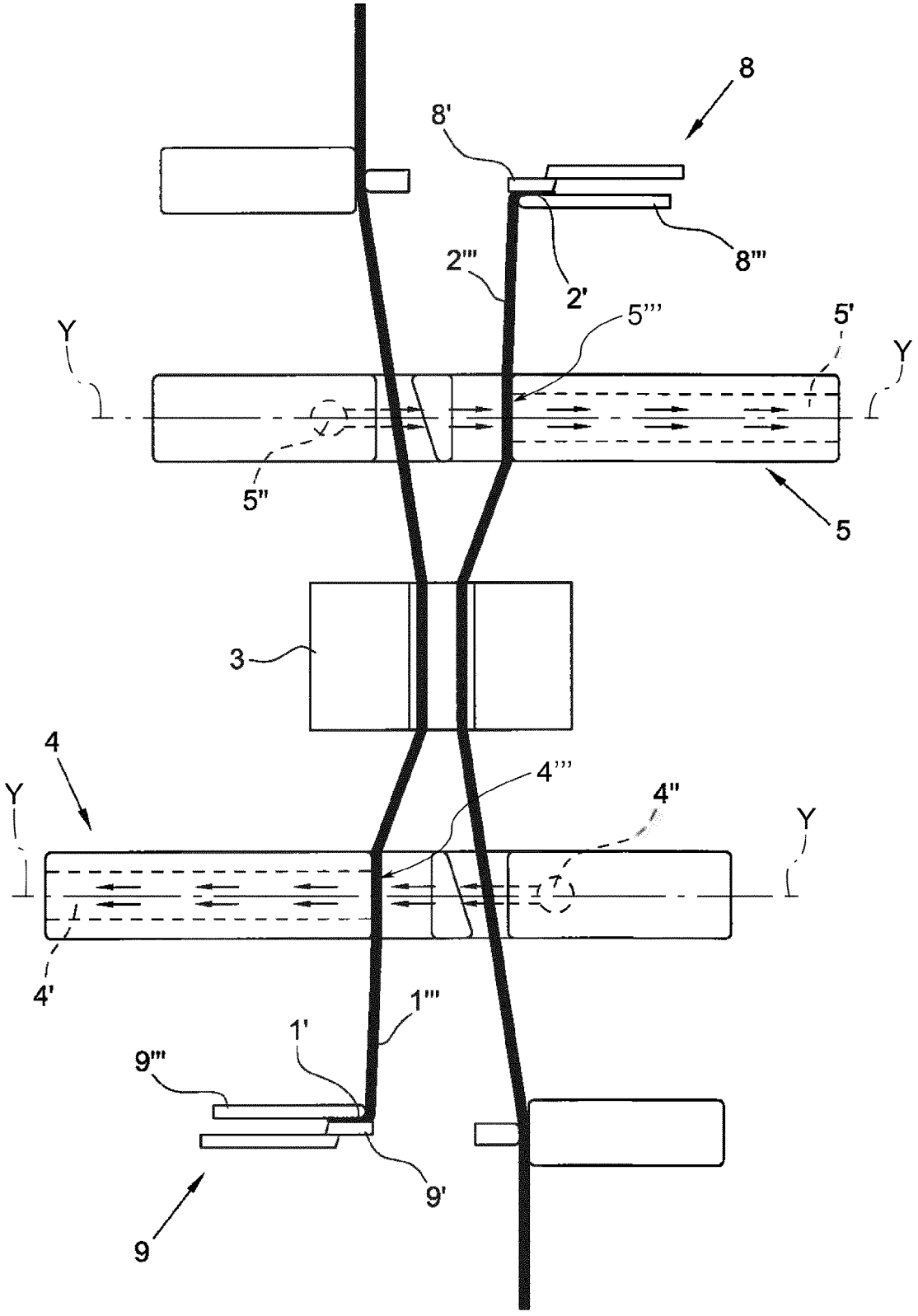


Fig. 5

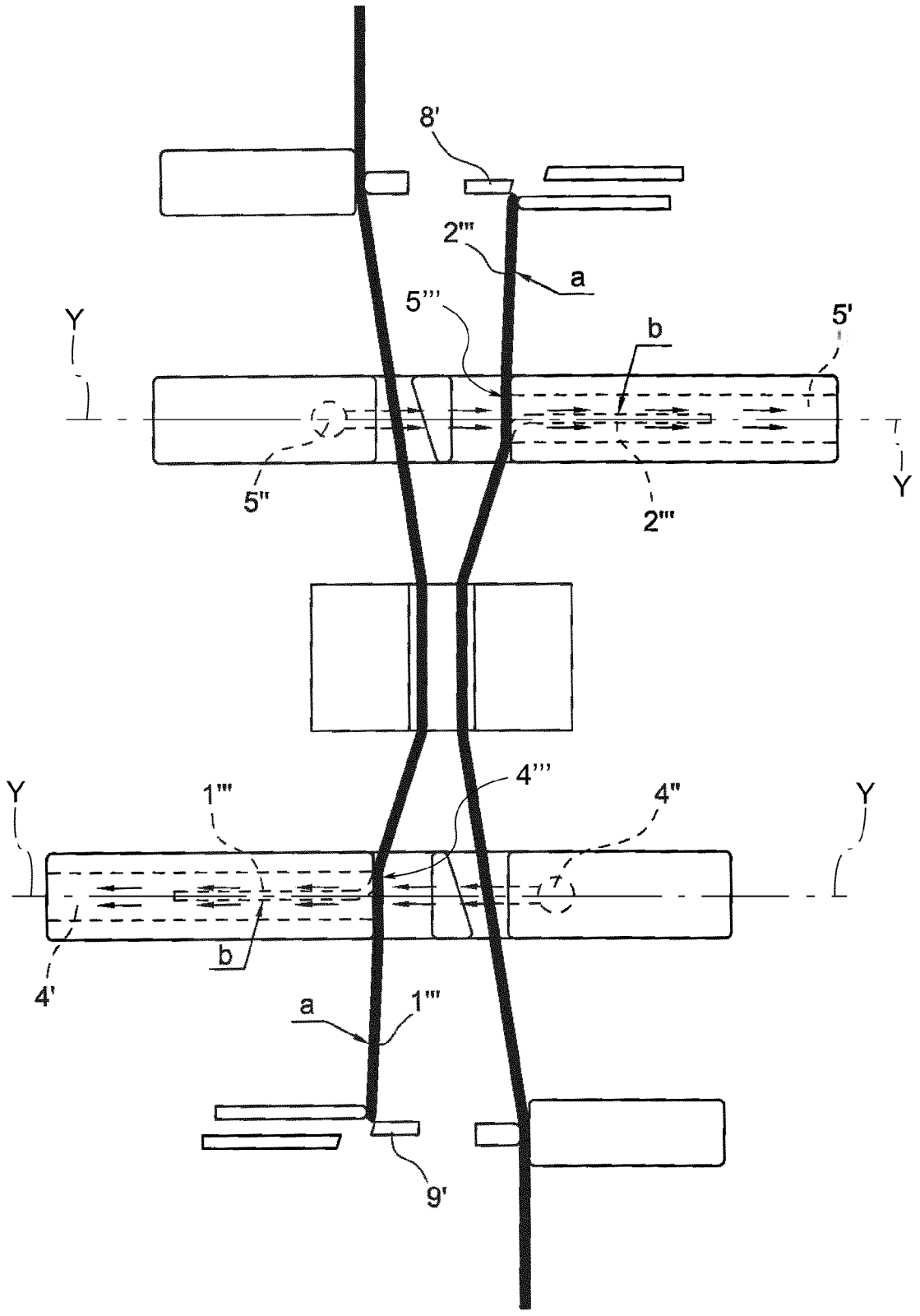


Fig. 6

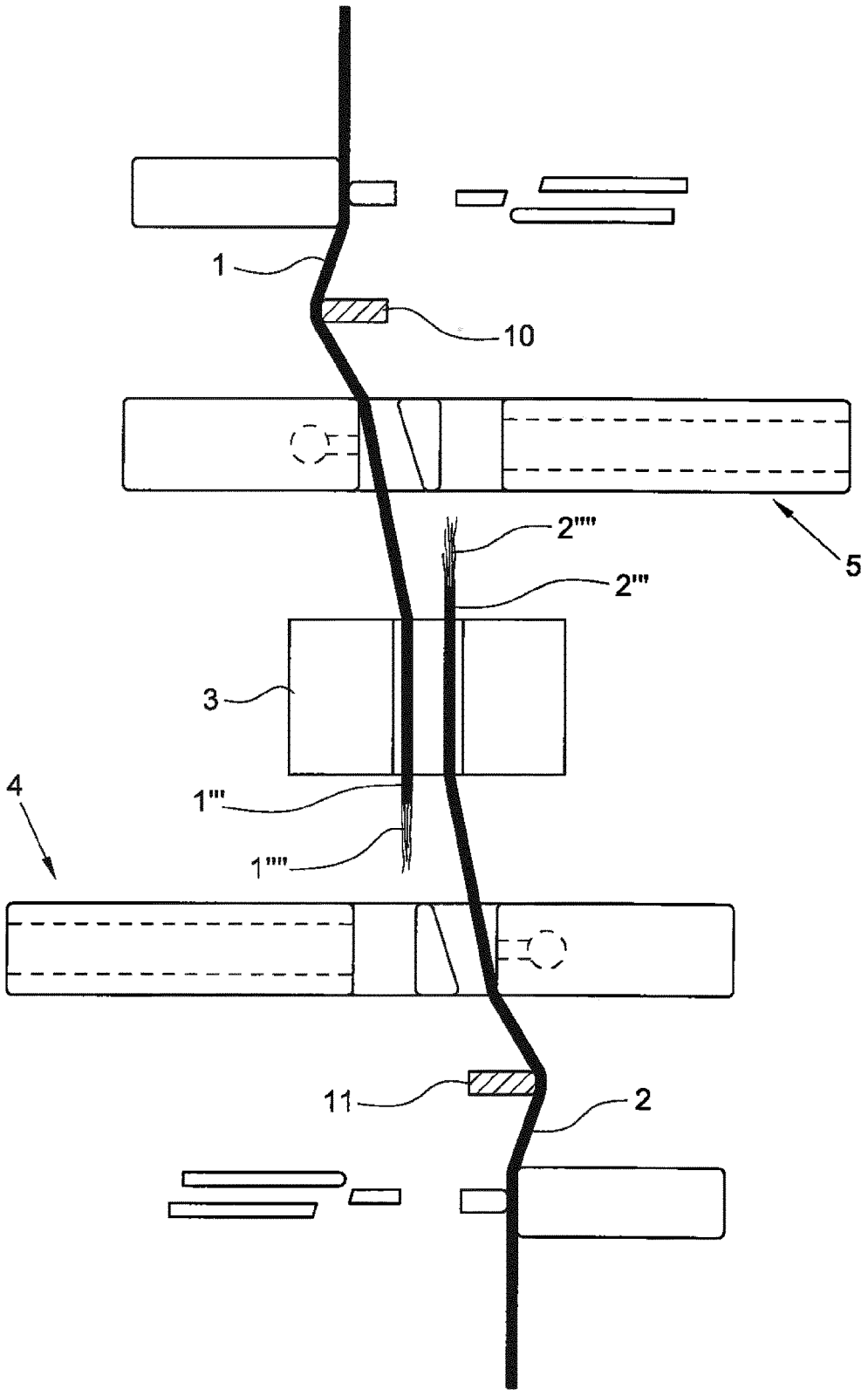


Fig. 7

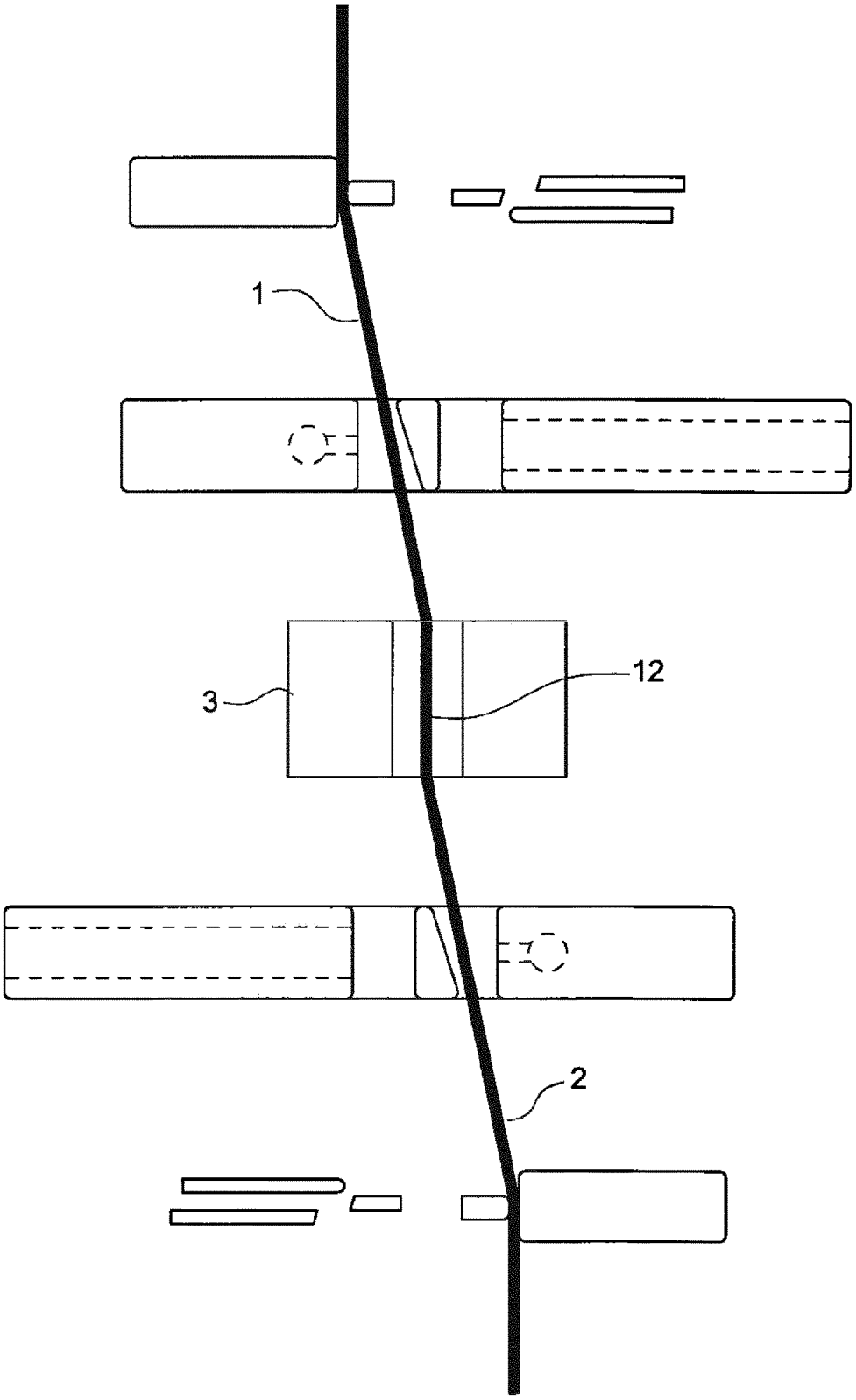


Fig. 8

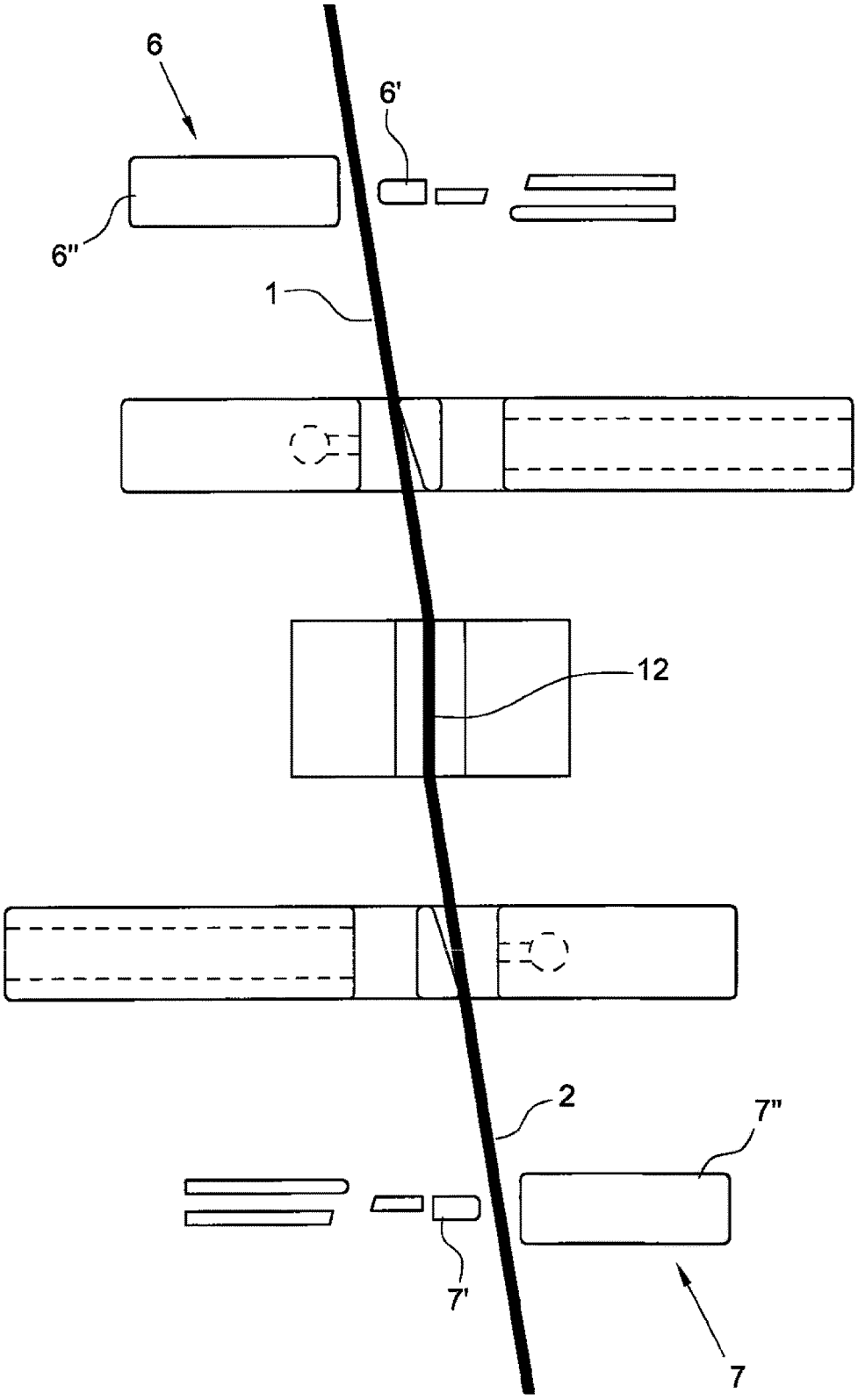


Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 13 18 8559

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	4 November 2013	Lemmen, René

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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