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(54) **Machine for stitching tubular pieces of fabric in series**

(57) A machine for stitching tubular pieces of fabric in series comprises a sewing machine (3) for stitching together at least two tubular pieces (S) of fabric to be connected at their respective end edges (BF, BI); a movement element (2) for imparting to the tubular pieces (S) a circular movement and for feeding the end edges (BF, BI) to the sewing machine (3) along a feed path (P); a positioning device (12) connected to the movement element (2) for holding the fabrics in position on the movement element (2) and keeping them taut along the feed path (P).

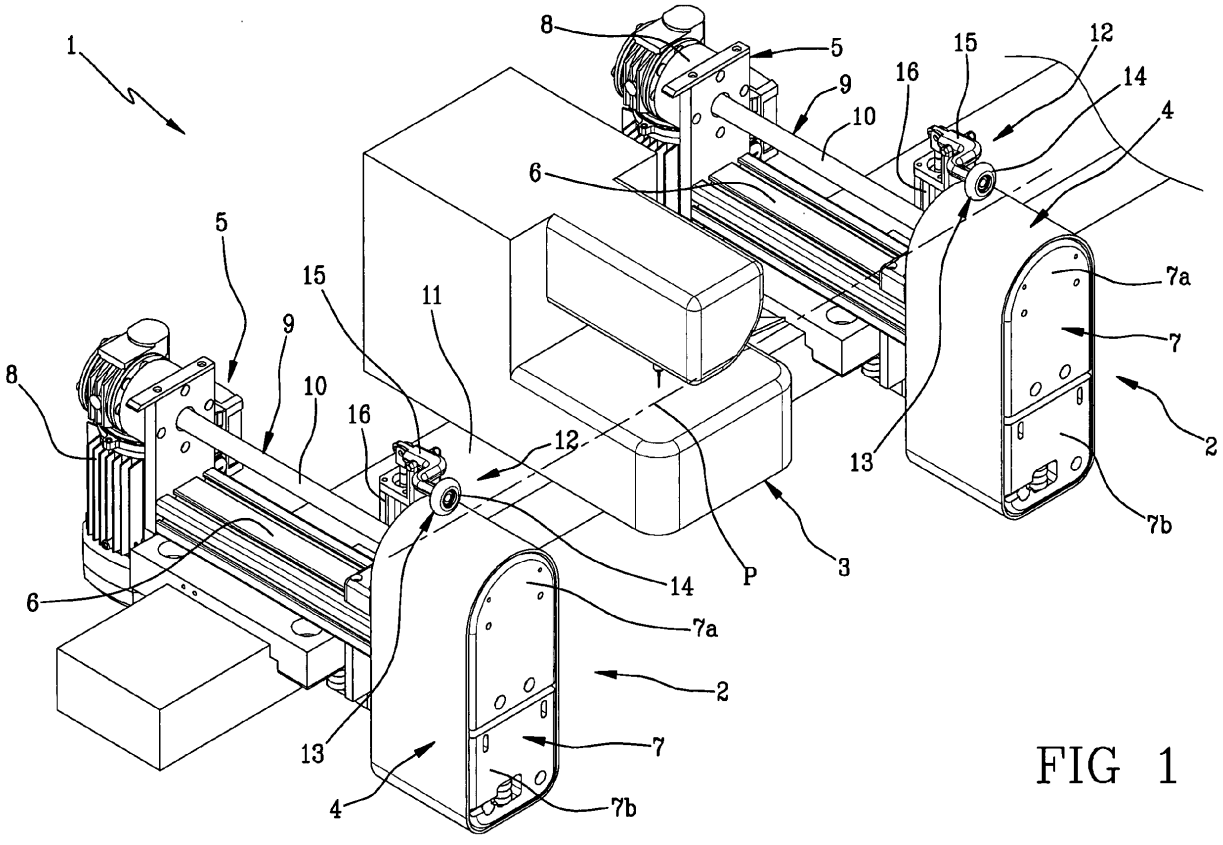

FIG 1

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Description

[0001] This invention relates to a machine for stitching tubular pieces of fabric in series.

[0002] This invention is advantageously applied for the serial connection of tubular pieces of fabric in preparation for subsequent processing of the pieces, such as, for example, dyeing.

[0003] In this text the term "piece" or "piece of fabric" refers to a length of fabric which may be gathered in rolls or in superposed folds or in any other way which allows its effective storage.

[0004] Prior art machines for stitching tubular pieces of fabric in series use stitching to connect a final end edge (called the tail) of one piece of fabric to a starting end edge (called the head) of the next tubular piece of fabric.

[0005] Hereinafter said edges are also referred to without distinction as ends.

[0006] In detail, such machines comprise a conveyor belt positioned transversally to a direction of feed for the pieces of fabric to be joined and on which the final edge and the starting edge of the pieces of fabric to be joined are positioned.

[0007] The conveyor belt is supported by at least two rollers located in opposite positions and at least one of which is connected to a motor.

[0008] A sewing machine is positioned along the conveyor belt, on a respective structural track, for stitching said edges together. In detail, the edges of the pieces of fabric are positioned on the belt in such a way that they project so that they can be fed to the sewing machine.

[0009] The conveyor belt supporting rollers are mounted on respective sliding carriages for varying their relative position depending on the diameter of the pieces of fabric to be connected. In that way, the supporting rollers are spaced from each other in such a way that the pieces of fabric to be joined fit perfectly on the conveyor belt and maintain the tension needed for the stitching operation.

[0010] In practice, when both of the pieces of fabric to be joined are fitted on top of each other on the conveyor belt, the latter is operated to generate a circular movement that pulls the piece of fabric, bringing the edges to the sewing machine so that they can be stitched together.

[0011] Disadvantageously, in prior art machines for stitching tubular pieces of fabric in series it is impossible to guarantee that the relative position of the edges of the pieces of fabric to be joined is maintained correctly during their movement and stitching.

[0012] In other words, during stitching the pieces of fabric may move in such a way that the stitching is decidedly irregular or defective or even interrupted.

[0013] This problem is even more noticeable in cases where the fabrics to be connected are particularly slippery, such as some fabrics made of synthetic fibre or silk.

[0014] Due to the above, the machines for stitching tubular pieces of fabric in series require constant visual control by an operator in charge of the connecting operation.

[0015] Moreover, the operator must correct the relative position of the pieces of fabric (even relative to the sewing machine position) where necessary and said correction is made manually.

[0016] As well as causing significant inconvenience when carrying out the operations described, this also entails considerable risks for the safety of the operator who handles the fabrics at the sewing machine and other moving parts.

[0017] In this context, the technical purpose which forms the basis of this invention is to propose a machine for stitching tubular pieces of fabric in series which overcomes the above-mentioned disadvantages of the prior art.

[0018] In particular, this invention has for an aim to provide a machine for stitching tubular pieces of fabric in series which can guarantee constant safe conditions for an operator.

[0019] This invention also has for an aim to propose a machine for stitching tubular pieces of fabric in series which is capable of continuous, precision stitching.

[0020] The stated technical purpose and the preset aims are substantially achieved by a machine for stitching tubular pieces of fabric in series having the technical features described in one or more of the appended claims.

[0021] Further features and advantages of this invention are more apparent in the detailed description below, with reference to a preferred, non-limiting, embodiment of a machine for stitching tubular pieces of fabric in series, illustrated in the accompanying drawings, in which:

- Figure 1 is a perspective view of a machine for stitching tubular pieces of fabric in series made in accordance with this invention;
- Figure 2 is a side view of the machine of Figure 1 ;
- Figure 3 is a perspective view of a detail of an alternative embodiment of the machine of Figure 1;
- Figure 3a is a view of an enlarged detail of the detail of Figure 3; and
- Figure 4 is a perspective view of a detail of another alternative embodiment of the machine of Figure 1.

[0022] With reference to the accompanying drawings, the numeral 1 denotes as a whole a machine for stitching tubular pieces of fabric in series.

[0023] It should be noticed that the term "stitching tubular pieces of fabric in series" in this case refers to the connection of a final end edge BF (or, in other words, a tail edge) of a tubular piece S of fabric to a starting end edge BI (or, in other words, a head edge) of the next tubular piece S of fabric.

[0024] The tubular pieces S of fabric to be connected may be wound on themselves and housed in a suitable machine 1 receiving compartment (not illustrated). The machine 1 comprises a movement element 2 which acts on the tubular pieces S to be connected and a sewing machine 3 of the known type which is located along the movement element 2 for stitching together the tubular

pieces S of fabric along their respective end edges or ends BF, BI.

[0025] In particular, the tubular pieces S are fitted on the movement element in such a way that the final end edge or end BF of one tubular piece S of fabric is substantially superposed on the starting end edge or end BI of the next tubular piece S.

[0026] The movement element 2 imparts to the tubular pieces S a circular movement for feeding the respective final and starting end edges or ends BF, BI to the sewing machine 3 along a feed path "P". The movement element 2 comprises at least one conveyor belt 4 which supports and moves the tubular pieces S to be connected. In more detail, the movement element 2 comprises a pair of carriages 5 which support the conveyor belt 4 and allow it to move. The carriages 5 are positioned on opposite sides of the sewing machine 3 and form the feed path "P" between them, as described in more detail below.

[0027] In an embodiment not illustrated, the movement element 2 comprises a single conveyor belt 4 supported by both carriages 5, alongside and close to the sewing machine 3. In that case, the conveyor belt 4, supported between the carriages 5, remains straight at least between the carriages 5 and forms the feed path "P" since the tubular pieces S are positioned and moved on the conveyor belt at their final and starting end edges BF, BI.

[0028] In the preferred embodiments illustrated, the movement element 2 comprises two conveyor belts 4 which are separate from each other and each connected to a respective carriage 5.

[0029] In more detail, each carriage 5 comprises a frame 6 and a supporting body 7 connected to the frame 6 and on which the respective conveyor belt 4 is positioned.

[0030] In that way, the tubular pieces S are positioned on top of the two conveyor belts 4 and supported in such a way that they lie suspended between the carriages 5 so that they extend substantially straight between one carriage 5 and the other.

[0031] Each carriage 5 also comprises a motor 8 which is operatively connected to the respective conveyor belt 4 and positioned on the opposite side of the frame 6 to the supporting body 7. In detail, a transmission element 9 transfers motion from the motor 8 to the supporting body 7 and from there to the conveyor belt 4. As illustrated in Figures 1 and 2, the transmission element 9 comprises a shaft 10 positioned along the frame 6 between the motor 8 and the supporting body 7.

[0032] It should be noticed that the feed speed of the conveyor belts 4 on the carriages 5 is the same to avoid generating unwanted tensions on the edges or ends BF, BI of the tubular pieces S.

[0033] In the embodiment illustrated, the supporting body 7 comprises an upper portion 7a which substantially has the shape of a semicylinder. The edges or ends BF, BI of the tubular pieces S of fabric are rested in contact with said portion. The supporting body 7 also comprises a lower portion 7b substantially having the shape of a parallelepiped. Advantageously, the carriages 5 can move towards and/or away from each other to vary the distance between them and adapt to different diameters of the tubular pieces S.

[0034] In particular, the carriages 5 can move along a straight guide 11. In more detail, the frame 6 of each carriage 5 is slidably connected to the guide 11.

[0035] According to this invention, the machine 1 also comprises a positioning device 12 connected to the movement element 2 for holding the edges or ends BF, BI of the tubular pieces S of fabric in such a way that they adhere to the movement element 2. More precisely, in practice, the positioning device 12 is in contact with the movement element 2 in such a way that the tubular pieces S of fabric lie interposed between the movement element 2 and the positioning device 12.

[0036] Consequently, the positioning device 12 holds the tubular edges or ends BF, BI in position on the conveyor belts 4, preventing them from coming out as they rotate.

[0037] In detail, the positioning device 12 comprises at least one pair of tensioning elements 13 in contact with the movement element 2. According to the accompanying drawings, in the preferred embodiment each tensioning element 13 is in contact with a respective carriage 5. More precisely, each tensioning element 13 rests on a respective conveyor belt 4.

[0038] The feed path "P" is therefore formed between the tensioning elements 13. Moreover, the sewing machine 3 is therefore positioned between the tensioning elements 13.

[0039] Each tensioning element 13 comprises a respective roller (or wheel) 14 which rests on the movement element 2 and a supporting arm 15 to which the roller 14 is hinged. It should be noticed that each roller 14 applies a contact force against the movement element 2 which holds the tubular edges or ends BF, BI of fabric securely against the movement element 2.

[0040] Said contact force can be varied and adjusted according to the type of fabric used to make the tubular pieces S.

[0041] For that purpose, the positioning device 12 comprises an actuator 16 connected to the supporting arm 15 for acting on the roller 14 and generating the contact force. In more detail, the actuator 16 has a first end connected to the carriage 5 frame 6 and a second end, opposite the first end, connected to a central portion of the supporting arm 15.

[0042] The actuator 16 may, for example, be hydraulic, pneumatic, electric or of another type.

[0043] The actuator 16 also has another function. Each tensioning element 13 can move between a first position in which it is raised and distant from the conveyor belt 4, allowing the tubular ends of the pieces S to be positioned on the movement element 2, and a second position in which it is lowered and rests on the movement element 2 in order to keep the tubular ends taut.

[0044] Each roller 14 has a contact surface 14a acting

directly on the tubular ends BF, BI of the pieces S. Said contact surface 14a may be smooth, ridged, knurled or embossed, depending on the application for which the rollers 14 are intended. Moreover, the contact surface 14a, or the entire roller 14, is made, for example, of metal such as steel or plastic - polymeric material such as rubber. Said plastic - polymeric material may have a degree of hardness which varies according to the type of fabric used to make the tubular pieces S to be connected.

[0045] In an embodiment not illustrated, the contact surface 14a has a plurality of projections and/or recesses which increase the actual surface area for contact between the roller 14 and the tubular ends BF, BI of the pieces S in such a way as to make the grip more effective.

[0046] In the embodiment illustrated in Figures 3 and 3a, the roller 14 comprises a plurality of needles 17 extending radially away from a cylindrical surface 14b of the roller 14. In that way, it is impossible to unambiguously define a contact surface, since the needles 17 penetrate the tubular pieces S to stably maintain the relative position between them and between the pieces and the conveyor belts 4. As shown in Figures 3 and 3a, the needles 17 are arranged in straight rows along the entire circular extension of the roller 14.

[0047] In said embodiment, each conveyor belt 4 comprises a pierced portion 4a extending along the entire conveyor belt 4. In that case, the pierced portion 4a of each conveyor belt 4 is positioned at the respective roller 14 equipped with the needles 17 so that the latter fit in the holes in the pierced portion 4a without damaging the conveyor belt 4 and thus increase the tensioning element 13 grip on the edges or ends BI, BF of the tubular pieces S.

[0048] In the embodiment illustrated in Figure 4, each tensioning element 13 comprises two supporting pulleys 18 between which an auxiliary belt 19 extends. The supporting pulleys 18 pivot on a supporting plate 20 which is in turn connected to the supporting arm 15. Moreover, the auxiliary belt 19 is passed over an intermediate roller 21 to keep the auxiliary belt 19 taut.

[0049] The supporting pulleys 18 and the intermediate roller 21 are preferably idle. In other words, the auxiliary belt 19 is idle.

[0050] In an alternative embodiment not illustrated, the positioning device 12 comprises a drive element acting on the auxiliary belt 19 for moving it in such a way that it has the same feed speed as the conveyor belt 4 with which it is coupled.

[0051] In practice, when the tensioning elements 13 are resting on the movement element 2 conveyor belts 4, each auxiliary belt 19 at least partly covers the conveyor belt 4. In more detail, each auxiliary belt 19 covers the conveyor belt 4 at the semicylinder-shaped upper portion 7a of the supporting structure 7.

[0052] It should be noticed that the tensioning elements 13 on the two carriages 5 may have the same shape. Alternatively, the tensioning elements 13 on the two carriages 5 may have different shapes.

[0053] Once the tubular pieces S are connected, they are sent towards a folding machine (not illustrated) connected downstream of the stitching machine 1 according to this invention.

[0054] The invention achieves the preset aims.

[0055] The positioning element guarantees that the position of one tubular piece relative to the other remains unchanged even during the circular movement which feeds the end edges or ends to the sewing machine. Moreover, the position between the tubular pieces and the sewing machine is also stably maintained.

[0056] In that way, there is no need for visual and manual control of positioning of the edges. In other words, there is no need for any manual operation by an operator close to the sewing machine or other moving parts.

[0057] Moreover, as a result of what was said above, the positioning device allows continuous, precise stitching.

[0058] Said reliability allows a reduction in the width of the end edges intended for stitching, thus limiting possible wasted fabric.

Claims

1. A machine for stitching tubular pieces of fabric in series comprising:

   a sewing machine (3) for stitching together at least two tubular pieces (S) of fabric to be connected at their respective end edges (BF, BI);
   a movement element (2) for imparting at least to portions of the tubular pieces (S) a circular movement for feeding the end edges (BF, BI) to the sewing machine (3) along a feed path (P);
   the machine being **characterised in that** it also comprises a positioning device (12) connected to the movement element (2) for holding the fabrics in position on the movement element (2) and keeping them taut along the feed path (P).

2. The machine according to claim 1, **characterised in that** the positioning device (12) comprises at least one pair of tensioning elements (13) in contact with the movement element (2), the feed path (P) being formed between the tensioning elements (13).

3. The machine according to claim 2, **characterised in that** the sewing machine (3) is positioned between the tensioning elements (13).

4. The machine according to claim 2 or 3, **characterised in that** the tensioning elements (13) apply against the movement element (2) a contact force which can vary depending on the type of fabric to be connected.

5. The machine according to claim 2, 3 or 4, **charac-**

terised in that each tensioning element (13) comprises a roller (14) resting on the movement element (2) and an arm (15) supporting the roller (14).

6. The machine according to claim 5, **characterised in that** the positioning device (12) comprises an actuator (16) connected to each roller (14) and connected to the respective supporting arm (15) for applying the contact force.

7. The machine according to claim 5 or 6, **characterised in that** the roller (14) has a contact surface (14a) comprising a plurality of projections and/or recesses for increasing the friction between the roller (14) and the tubular pieces (S) of fabric to be connected.

8. The machine according to claim 5, 6 or 7, **characterised in that** the roller (14) comprises a plurality of needles (17) arranged radially on a cylindrical surface of the rollers (14).

9. The machine according to any of the claims from 3 to 8, **characterised in that** each tensioning element (13) comprises two supporting pulleys (18) between which an auxiliary belt (19) extends for at least partly covering the movement element (2).

10. The machine according to any of the foregoing claims, **characterised in that** the movement element (2) comprises at least one conveyor belt (4) for supporting and moving the tubular pieces (S) of fabric to be connected and at least two carriages (5) positioned on opposite sides of the sewing machine (3) for supporting and moving the conveyor belt (4).

11. The machine according to claim 10, **characterised in that** the movement element (2) comprises two separate conveyor belts (4), each being connected to a respective carriage (5).

12. The machine according to claim 10 or 11, **characterised in that** the conveyor belt (4) comprises a pierced portion (4a) extending along the entire conveyor belt (4) and positioned at the rollers (14).

13. The machine according to claim 10, 11 or 12, **characterised in that** the carriages (5) can move towards and/or away from each other to vary the distance between them depending on the size of the tubular pieces (S) of fabric to be connected.

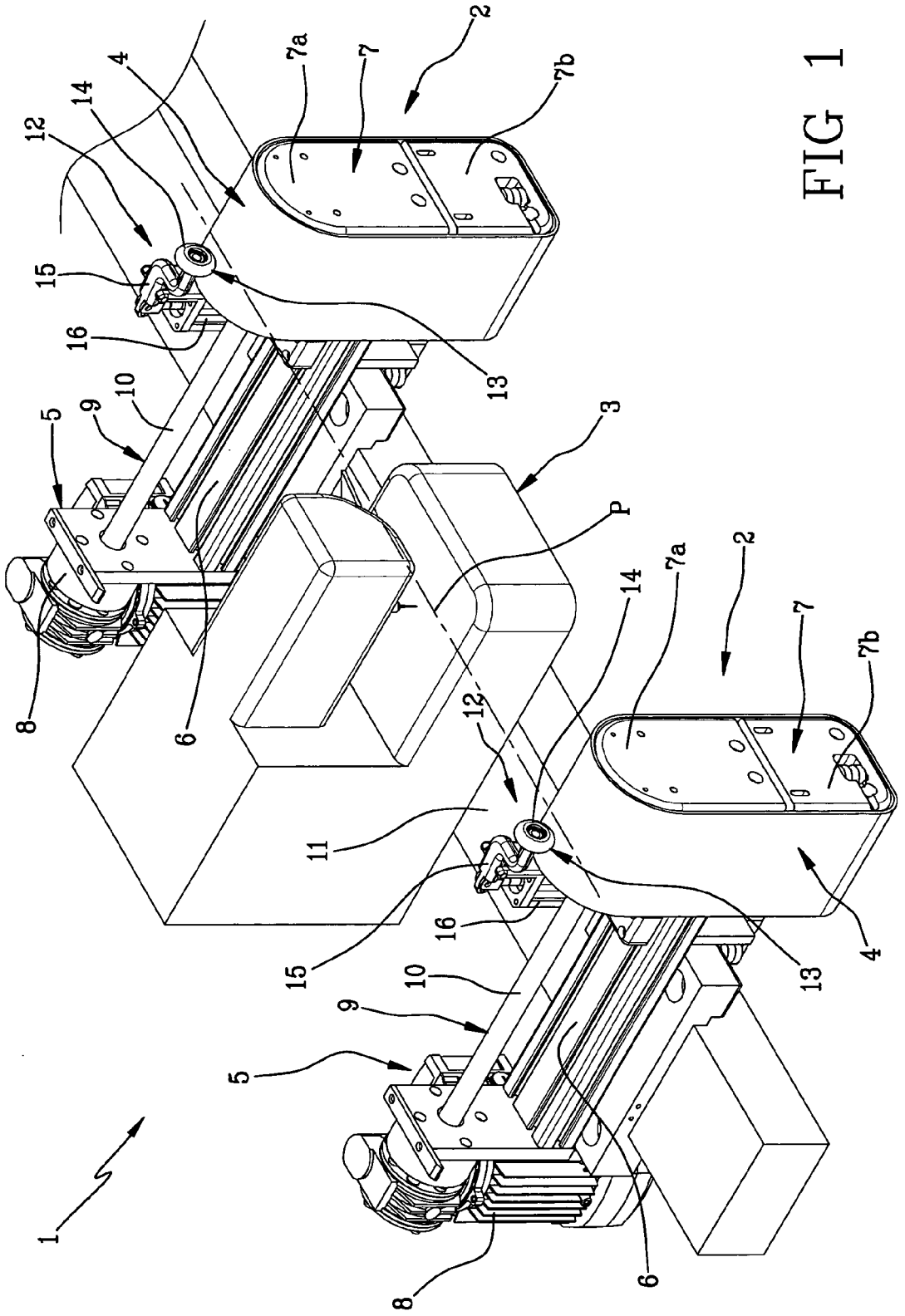


FIG 1

FIG 2

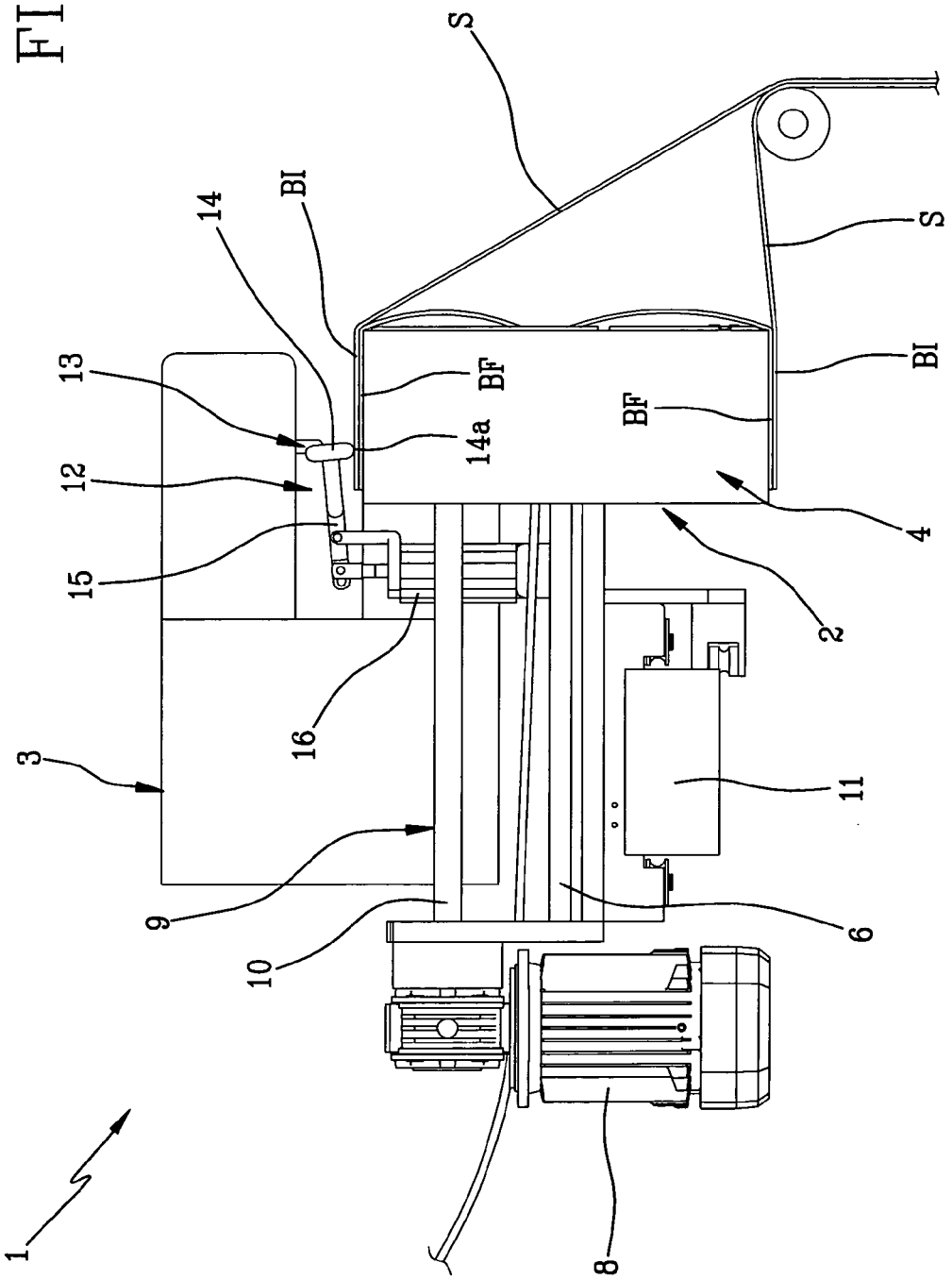
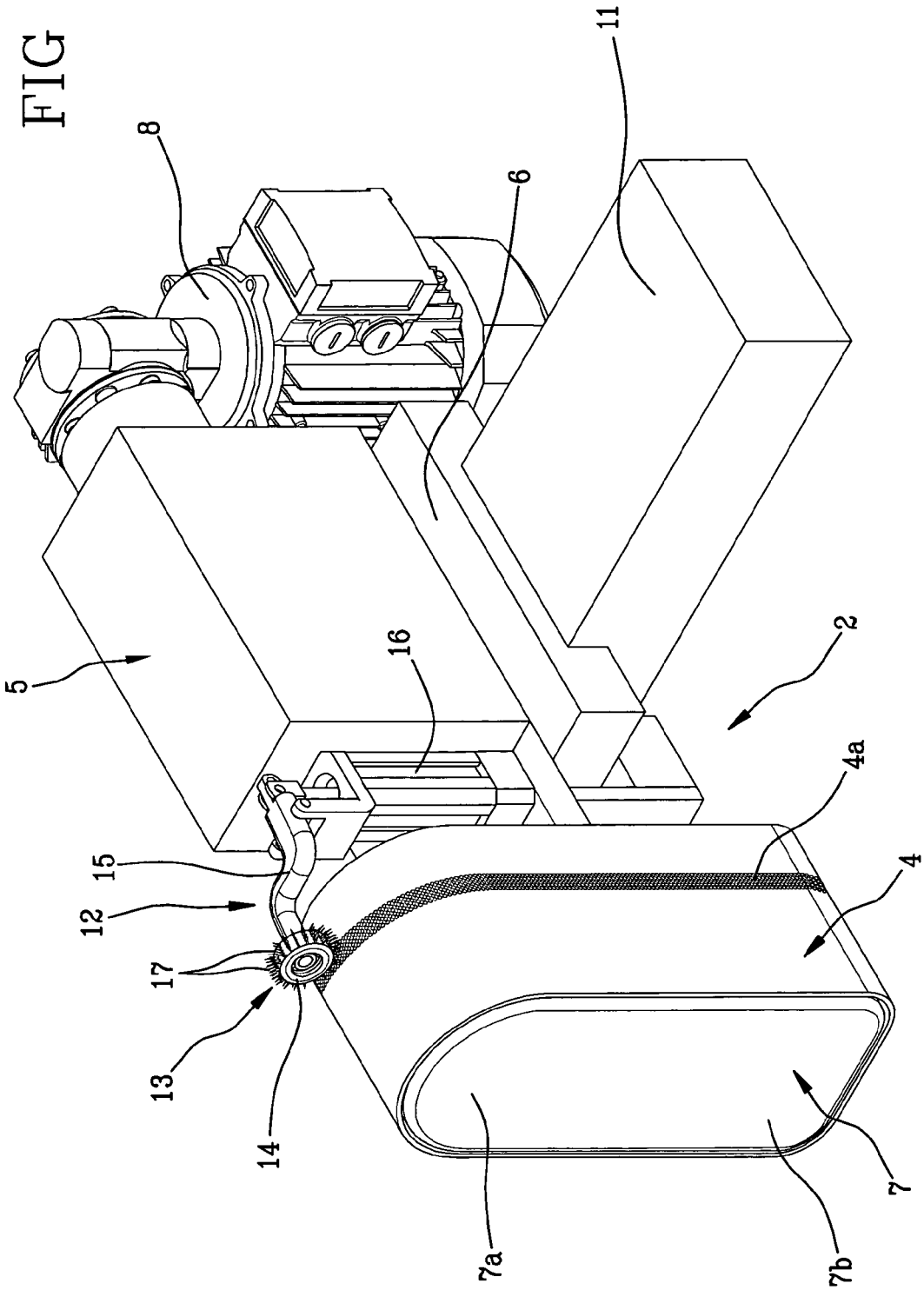


FIG 3



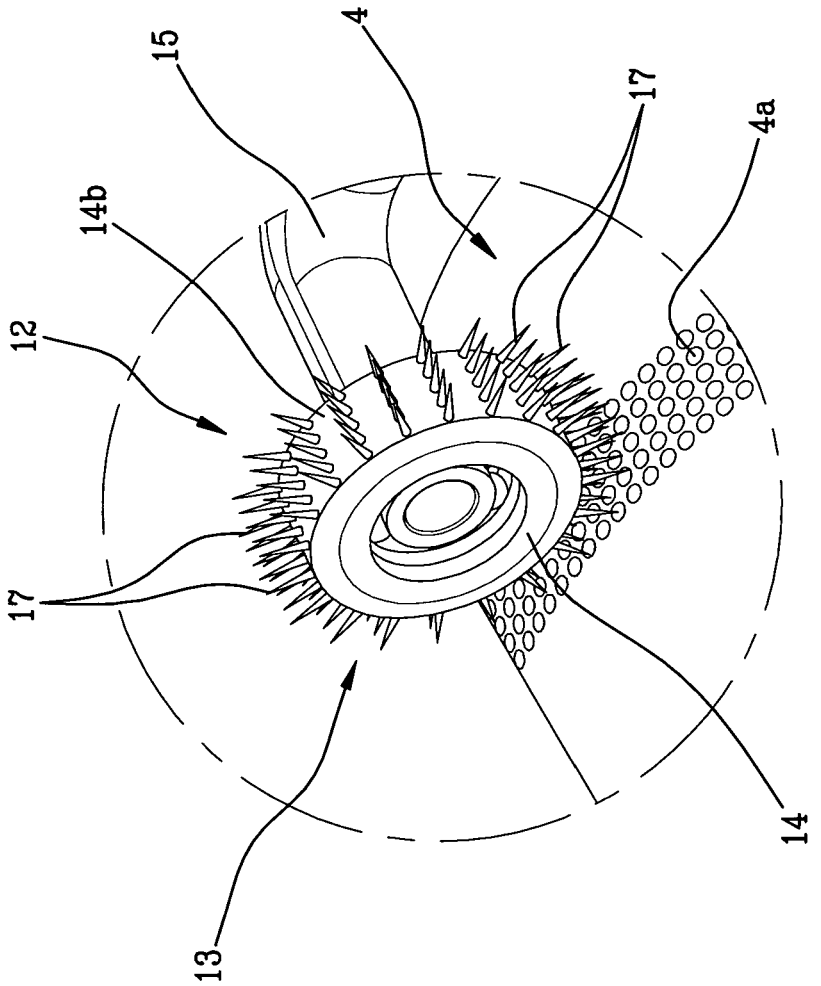
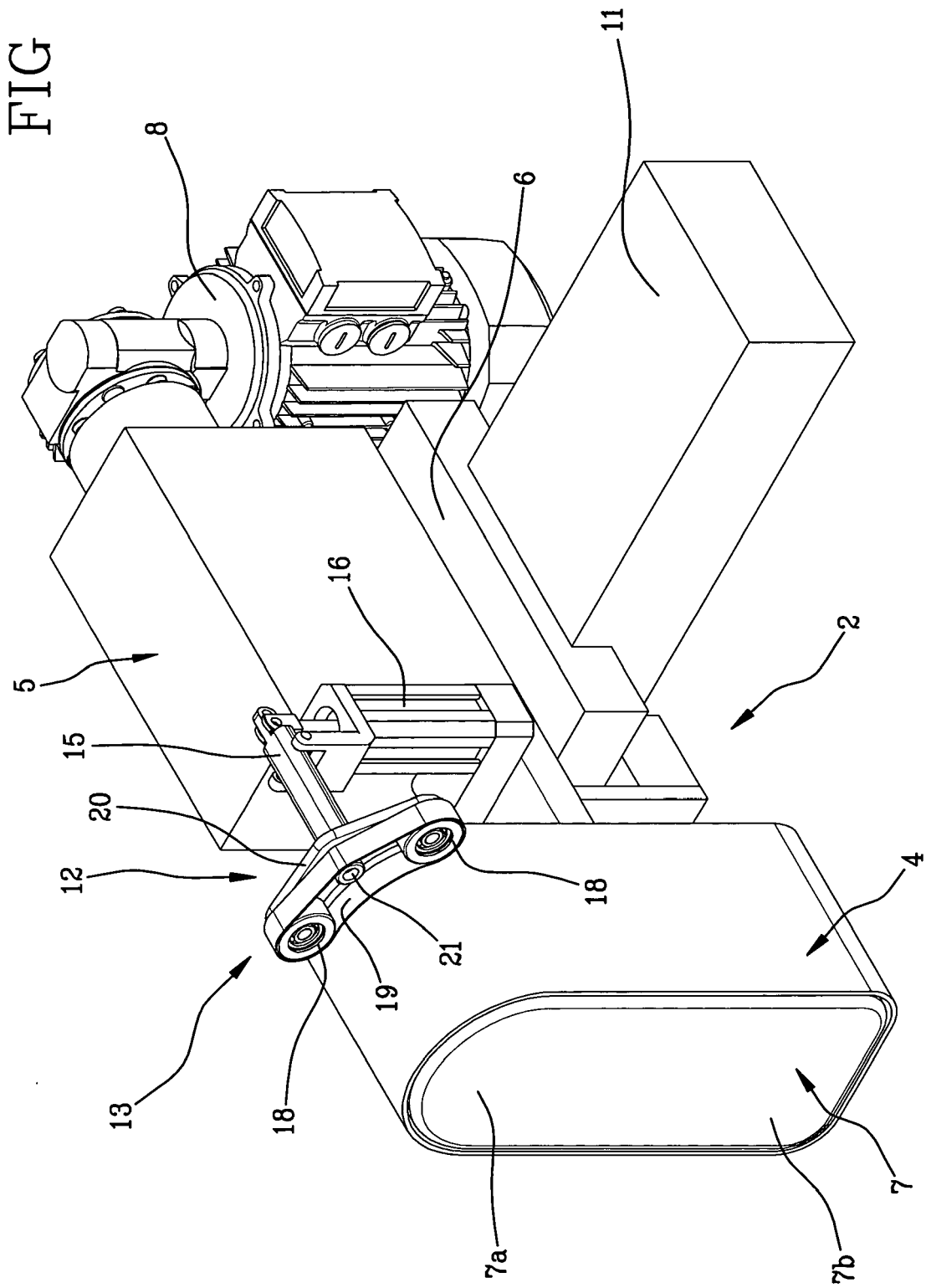


FIG 3a

FIG 4



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EUROPEAN SEARCH REPORT

Application Number
EP 09 42 5432

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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
Munich	29 April 2010	Herry-Martin, D

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
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Munich	29 April 2010	Herry-Martin, D

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