

(19)



(11)

EP 3 800 289 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

07.04.2021 Bulletin 2021/14

(51) Int Cl.:

D06N 7/00 (2006.01) **A47G 27/02** (2006.01)
A47G 27/04 (2006.01) **B26D 1/30** (2006.01)
B26D 7/27 (2006.01) **B26F 3/08** (2006.01)
D06H 7/22 (2006.01) **D05B 35/06** (2006.01)
D05B 65/06 (2006.01) **D06C 13/12** (2006.01)
D05B 23/00 (2006.01) **D05B 37/10** (2006.01)

(21) Application number: **19201531.1**

(22) Date of filing: **04.10.2019**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

Designated Validation States:

KH MA MD TN

(71) Applicant: **Handsaeme Machinery BVBA**
8870 Izegem (BE)

(72) Inventor: **Handsaeme, Olivier**
8770 Ingelmunster (BE)

(74) Representative: **IP HILLS NV**
Hubert Frère-Orbanlaan 329
9000 Gent (BE)

(54) **METHOD AND DEVICE FOR FINISHING AN EDGED FABRIC**

(57) A method for finishing an edged fabric (100) comprising one or more loose ends (300) of cut edging material, the method comprising:

- a heating step (501), comprising heating the bottom side (508) of the fabric (100), resulting in a molten struc-

ture;

- a swiping step (504), comprising sliding a swiping element (500) and the bottom side (508) of the fabric (100) over each other, thereby rubbing the loose ends (300) into the molten structure by the swiping element (500).

EP 3 800 289 A1

Description

Field of the Invention

[0001] The present invention generally relates to the field of edging a fabric. More particularly, an automated solution is presented that allows to finish a serged edge in a visually satisfactory way and that results in an enduring quality of the fabric edge.

Background of the Invention

[0002] During production of a fabric, e.g. a carpet or a rug, the edges need to be finished in order to prevent fraying thereof. In general, edging of a fabric may be done by binding or serging. Binding implies that a piece of binding material, e.g. (artificial) leather, is folded over the edge of the fabric and stitched on with a binding machine that is similar to a commercial sewing machine. On the other hand, a serged edge is a continuous wrap of yarn around the edge of a rug. A machine similar to an overlock sewing machine is used to create loops of sewing thread, being substantially perpendicular to the edge of the carpet. A series of thread loops next to each other along the edge covers the whole edge of the rug. Serging is an easy way to finish fabrics as it goes on quickly and only requires some yarn as edging material. In some regions, like e.g. the US, the majority of sold carpets comprises serged edges.

[0003] In a production environment, an automated sewing machine is used for sequentially serging individual edges of consecutive carpets. E.g., the short side of a first carpet is edged, next the short side of a second carpet is edged, etc. This is usually done in a continuous process, whereby the sewing machine is not stopped in between two carpets. A start/stop-process would unnecessarily shorten the lifetime of the sewing machine and reduce the production capacity. Therefore, after serging, two sequential carpets are still connected by a thread of edging material, which needs to be cut to separate the carpets. After cutting, loose ends of cut edging material are obtained, which need to be fixed in order to prevent fraying of the serged edge. Moreover, as a serged edge comprises loops of edging material, being stitched only with one end to the fabric, such loops may tend to pivot during use of the carpet, thereby revealing bald spots in the edge. This is especially a risk at a corner of the carpet, where a loop of edging material may tend to change direction by pivoting around the corner.

[0004] Consequently, there is a general need for a solution allowing for a durable serged edge, preventing wearing due to fraying or displacements of edging material.

[0005] Various solutions are known in the prior art for finishing an edged carpet. For example, after separation from the neighbouring edged carpet, a manual finishing may be done to fix the loose ends of edging material. In this manual process, a worker heats up the fibres in the

corners or at the edges of the carpet by means of a lighter or other heating source, and subsequently presses the fibres together using his fingers. This method requires a lot of manpower and therefore involves a large labour cost. Moreover, the obtained quality may vary, and the manipulation of heat sources involves a risk of fire and burns.

[0006] In BE2008/0704 an ultrasonic welding apparatus is used for cutting the threads between sequentially edged carpets, and for fixing the obtained loose ends of edging material. In this solution, loose material is welded together, resulting in a straight welding seam at the side of the carpet edge. The welded seam may be sharp, and as the welding seam is visible from above, the edge doesn't look nice when the carpet is put on the ground. The visual view is even more deteriorated if the straight weld is angled relative to the edge, e.g. caused by non-accurate positioning of the carpet during welding. Finally, the loops of edging material themselves are not being fixed, which may result in early wear of the carpet edge.

[0007] In WO2005/021856 a device is presented for fixing an edge of a carpet, comprising two parts movable with respect to one another. The two parts are pushed together, with the corner of a carpet in between them. At the same time, the two parts are heated, causing the yarn on top and bottom of the carpet to melt. Because of the contact heat and pressing force, the structure of the fabric is changed, causing an unwanted visual difference with the rest of the carpet, especially at the top side. Moreover, to avoid the molten fibres from getting stuck to the contact surfaces, the surfaces need to be provided with a specific coating, resulting in an additional cost. Finally, the positioning of the carpet corner in the device, as well as the positioning of the loose ends of edging material is not automated and may result in a bad fixing of the loose ends and unsatisfactory visual results.

[0008] It is an objective of the present invention to disclose a method and device for finishing an edged fabric, that resolves one or more of the above described shortcomings of prior art solutions. More particularly, it is an objective to present an automated solution that allows to finish a serged edge in a visually satisfactory way and that results in an enduring quality of the fabric edge.

Summary of the Invention

[0009] According to a first aspect of the present invention, the above identified objectives are realized by a method for finishing an edged fabric comprising one or more loose ends of cut edging material, the method comprising:

- a heating step, comprising heating the bottom side of the fabric, resulting in a molten structure;
- a swiping step, comprising sliding a swiping element and the bottom side of the fabric over each other, thereby rubbing the loose ends into the molten structure by the swiping element.

[0010] Thus, the invention concerns a method for finishing an edged fabric. A fabric may e.g. be a rug or a carpet, e.g. a tufted or woven carpet, a wall to wall carpet, a carpet runner, etc. An edged fabric implies that some processing step has been done to edge the fabric, i.e. for treating the edge of the fabric in order to prevent fraying thereof. In an embodiment, edging may refer to serging. Serging implies that a continuous wrap of yarn is provided around the edge of a rug. E.g., a machine similar to an overlock sewing machine is used to create loops of sewing thread, being substantially perpendicular to the edge of the carpet. A series of thread loops next to each other along the edge typically covers the whole edge of the rug. The edging material may be e.g. yarn of Polyamide, Polypropylene, etc. In another embodiment, edging may refer to binding. Binding implies that a piece of binding material, e.g. a strip of Polypropylene or artificial leather, is folded over the edge of the fabric and stitched on.

[0011] An automated sewing machine may be used for sequentially edging consecutive carpets. E.g., the short side of a first carpet is edged, next the short side of a second carpet is edged, etc. This is typically done in a continuous process, whereby the sewing machine is not stopped in between two carpets. Therefore, after edging, two sequential carpets are still connected by a thread of edging material, which is cut to separate the carpets. After cutting, loose ends of cut edging material are obtained. In an embodiment, loose ends of edging material may refer to loose ends of e.g. Polyamide or Polypropylene which was used to form the loops along the edge of the fabric during serging. In another embodiment, loose ends of edging material may refer to loose ends of sewing thread or loose ends of binding material, e.g. artificial leather or Polypropylene, where the sewing thread and/or binding material were used for binding the edge of a fabric. Finishing the edged carpet implies that some processing is done to further treat the loose ends of edging material, e.g. to fix them in order to prevent fraying.

[0012] The method comprises a heating step, comprising heating the bottom side of the fabric, resulting in a molten structure. Heating may be done by any heating source, e.g. a burner or a device blowing hot air. The heating is done in such a way that fibres of the fabric are molten, without burning them. In a preferred embodiment, no direct contact between the heating source and the fabric occurs, to prevent that molten material sticks to the material of the heating source. The heating is done at the bottom side of the fabric. The bottom side is defined as the non-visible side of a carpet or a rug, when being in use. The heating results in a zone of molten fibres at the bottom side of the fabric, without changing the fibres at the top side of the fabric. Typically, the bottom side is heated close to the corner of the fabric, but in other embodiments, heating may be done at a more central position along the edge.

[0013] The method comprises a swiping step, comprising sliding a swiping element and the bottom side of the

fabric over each other. This implies that a sliding movement between the swiping element and the bottom side of the fabric is established, being a movement during which contact is made between a surface of the swiping element, and part of the surface of the bottom side of the fabric. In an embodiment, the bottom side of the fabric may be slid over the swiping element, while the swiping element does not move. In another embodiment, the swiping element may be slid over the bottom side of the fabric, while the fabric does not move. In yet another embodiment, both the swiping element and the fabric may move during the sliding movement.

[0014] The sliding movement is such that the loose ends of edging material are rubbed into the molten structure by the swiping element. Thus, due to the sliding movement the loose ends are pressed into the molten fibres, such that they stick in the molten structure and are fixed to the bottom side of the fabric after hardening of the molten fibres. The swiping element may be any element being adapted for rubbing the loose ends into the molten structure. For example, it may be a strip of material having an elongated form, with a width according to the size of the molten zone and where the sliding movement occurs following the length direction of the swiping element. In a preferred embodiment, the material of the contact surface of the swiping element is chosen such that the molten fibres of the fabric do not stick to the surface of the swiping element.

[0015] The use of a swiping element during the sliding movement implies that the loose ends of edging material are not rubbed into the molten structure using one's fingers, but that a specific element is used for this. In an embodiment, the sliding movement between the fabric and the swiping element may be established in a manual way. In a preferred embodiment, a driving element is provided, which is adapted to establish the sliding movement between the swiping element and the fabric in an automated way.

[0016] The first aspect of the invention is advantageous compared to solutions known in the prior art, because of various aspects. Firstly, the use of a swiping element for rubbing the loose ends into the molten structure avoids a direct contact of one's fingers with the molten structure, thereby lowering the risk of burns and preventing that a varying quality is obtained due to manual rubbing. Moreover, the swiping element allows to spread out the molten fibres of the fabric, such that a larger zone of molten material is obtained in which the loose ends of edging material may be fixed along their whole length. This results in a better quality, where all the loose ends are strongly fixed, thereby preventing fraying of the fabric edge. Furthermore, as the heating step involves the melting of a whole zone at the bottom side of the fabric, not only fibres of the fabric itself are melted, but also some edging material may be melted. This implies that, considering a serged edge, some loops, in particular close to the corner of the fabric, may be fixed due to melting and hardening. As such, pivoting of those loops during

use of the fabric is prevented, thereby contributing to a long-lasting edge of high quality.

[0017] Another advantage is that a visually attractive result is obtained. Indeed, as only fibres at the bottom side of the fabric are molten, and the loose ends are fixed to the bottom side, the top side remains unaffected and no seam occurs at the side of the fabric. Therefore, the finishing process does not affect the part of the fabric being visible for the user. Moreover, an inaccurate positioning of the fabric while doing the finishing does not affect the visual result for the user, as a non-straight fixing is only visible at the bottom side of the fabric.

[0018] Another advantage is that the heating step and the swiping step are two distinctive steps. Therefore, the heating element may be chosen in function of the heating function, e.g. heating the bottom side in an indirect way, while the swiping element may be chosen in function of the rubbing function, e.g. preventing sticking of the molten fibres to the surface of the swiping element. Therefore, the swiping element may be a simple element in a common material, e.g. a rubber or silicone strip. As such, no special coatings, provided on a heated metal to prevent sticking of the molten fibres to the metal serving as heating source, are required. This contributes to a simple and cheap solution.

[0019] Finally, the method comprising a heating step and a swiping step may be automated, e.g. by providing a driving element causing the sliding movement in the swiping step. This has the advantage that less manpower is needed, thereby reducing the labour cost.

[0020] Optionally, the method further comprises a preparation step preceding the swiping step, the preparation step comprising sliding the swiping element and the edge of the fabric over each other, thereby moving the loose ends towards the bottom side of the fabric. This implies that the swiping element is not only used during the swiping step, but also in a preparation step, preceding the swiping step. During the preparation step, the swiping element and the edge of the fabric are slid over each other. In an embodiment, the swiping element may be slid over the edge of the fabric, while the fabric does not move. In another embodiment, the edge of the fabric may be slid over the swiping element, while the swiping element does not move. In yet another embodiment, both the fabric and the swiping element may be moved during the preparation step.

[0021] The sliding of the swiping element and the edge of the fabric is such that the loose ends of edging material are moved towards the bottom side of the fabric. For example, during this movement, the swiping element may touch the edge of the fabric while being in a position substantially perpendicular to the surface of the fabric. This has the advantage that loose ends, originally situated at the side of the edge, are brought to the bottom side of the fabric, where they are rubbed into the molten zone during the subsequent swiping step. This contributes to a better quality of the finishing, as all loose ends are fixed and they are first well positioned before being fixed. More-

over, the same simple swiping element may be used both in the preparation step and the swiping step, contributing to cheaper solution. Finally, the preparation step may be automated by driving the movement between the swiping element and the edge of the fabric. This contributes to a reduced manpower and lower labour cost.

[0022] Optionally, the method further comprises an initial preparation step preceding the preparation step, the initial preparation step comprising sliding the swiping element and the top side of the fabric over each other, thereby moving the loose ends lying at the top side towards the edge of said carpet. This implies that the swiping element is not only used during the preparation step and the swiping step, but also in an initial preparation step, preceding the preparation step. During the initial preparation step, the swiping element and the top side of the fabric are slid over each other. In an embodiment, the swiping element may be slid over the top side of the fabric, while the fabric does not move. In another embodiment, the top side of the fabric may be slid over the swiping element, while the swiping element does not move. In yet another embodiment, both the fabric and the swiping element may be moved during the initial preparation step.

[0023] The sliding of the swiping element and the top side of the fabric is such that the loose ends of edging material lying at the top side of the fabric are moved towards the edge of said carpet. For example, the swiping element is slid over the top side of the fabric, starting at a more central position on the top side of the fabric, and moving towards the edge of the fabric. This has the advantage that loose ends originally situated at the top side of the fabric are brought to the edge side of the fabric, where they may be taken towards the bottom side during the subsequent preparation step. This contributes to a better quality of the finishing, as all loose ends are fixed and they are first well positioned before being fixed. Moreover, the same simple swiping element may be used in the initial preparation step, the preparation step and the swiping step, contributing to cheaper solution. Finally, it may allow for a further automation, where the movement during the initial preparation step is driven, resulting in a lower labour cost.

[0024] Optionally, the method comprises moving the swiping element towards a position adapted for the swiping step, while doing the initial preparation step and the preparation step. This implies that during the initial preparation step and the preparation step, the swiping element is moved such that it is first being slid over the top side of the fabric, and next over the edge of the fabric. The movement ends in a position being adapted for the swiping step, e.g. a position in which the swiping element is held during the swiping step, or a position from which a movement of the swiping element during the swiping step starts. This has the advantage that all loose ends are brought to the bottom side to be fixed, and that they are well positioned before being fixed, contributing to a better resulting quality. Moreover, this is done during a

continuous movement of the swiping element, resulting in an efficient process. Furthermore, the movement of the swiping element may be automated, resulting in a lower labour cost.

[0025] Optionally, the swiping element changes from an extended condition during the initial preparation step, next to a bent condition during the preparation step, next to a folded condition during the swiping step. For example, the swiping element has an elongated form, and it is in an extended, non-folded, condition while being slid over the top side of the fabric during the initial preparation step. Next, the swiping element may e.g. be bent over the edge of the fabric to bring the loose ends towards the bottom side of the fabric during the preparation step. In this bent condition, the swiping element e.g. has a curved shape. Next, the swiping element may be folded while moving it to rub the molten structure at the bottom of the fabric. The bent and folded condition may involve an elastic deformation, such that the swiping element can be brought in its original elongated form again. For example, a flexible material is used for the swiping element, to allow for such a elastic deformation.

[0026] Optionally, the method further comprises a pressing step, comprising pressing the molten structure onto the swiping element. This implies that after the swiping step, another step is executed, in which the fabric is pressed to the swiping element. For example, some stamping device is used, which is pushed onto the fabric in a direction substantially perpendicular to the surface of the fabric. In an embodiment, during the pressing step, the swiping element and the fabric may be in the position as was reached at the end of the swiping step. They may both be hold in that position during the pressing step. Pressing the molten structure onto the swiping element has the advantage that the loose ends of edging material are additionally pressed into the molten fibres, such that a better fixing of the loose ends is obtained. Moreover, also the molten edging material is pressed, such that neighbouring loops may stick together. This contributes to a better quality and durability of the obtained edge.

[0027] According to a second aspect of the present invention, one or more of the above identified objectives are realized by a device for finishing an edged fabric comprising one or more loose ends of edging material, the device comprising:

- a heating element adapted to heat the bottom side of the fabric, resulting in a molten structure;
- a swiping element and a driving element, wherein the driving element is adapted to establish a sliding movement of the swiping element and the bottom side of the fabric over each other, the swiping element being adapted to rub the loose ends into the molten structure during the sliding movement.

[0028] Thus, the second aspect of the invention concerns a device for finishing an edged fabric comprising one or more loose ends of edging material. An edged

fabric may e.g. be a rug or a carpet, being edged through serging or binding, as defined above. After cutting the edging material between two fabrics being sequentially edged, an edged fabric comprises one or more loose ends of edging material, as defined above. Finishing the edged carpet implies that some processing is done to further treat the loose ends of edging material, e.g. to fix them in order to prevent fraying.

[0029] The device comprises a heating element adapted to heat the bottom side of the fabric, resulting in a molten structure. The heating element may be any heating source, e.g. a burner or a device blowing hot air. The heating element is adapted to provide heat such that fibres of the fabric are molten, without burning them. In a preferred embodiment, no direct contact between the heating element and the fabric occurs, to prevent that molten material sticks to the material of the heating element. The heating is done at the bottom side of the fabric. The bottom side is defined as the non-visible side of a carpet or a rug, when being in use. The heating results in a zone of molten fibres at the bottom side of the fabric, without changing the fibres at the top side of the fabric. Typically, the bottom side is heated close to the corner of the fabric, but in other embodiments, heating may be done at a more central position along the edge.

[0030] The device comprises a swiping element and a driving element. The driving element is adapted to establish a sliding movement of the swiping element and the bottom side of the fabric over each other. The sliding movement is a movement in which contact is made between a surface of the swiping element, and part of the surface of the bottom side of the fabric. In an embodiment, the driving element may cause the bottom side of the fabric may to be slid over the swiping element, while the swiping element does not move. In another embodiment, the driving element may cause the swiping element to be slid over the bottom side of the fabric, while the fabric does not move. In yet another embodiment, the driving element may cause both the swiping element and the fabric to move during the sliding movement. The driving element may be any element being adapted to establish the respective movement(s). For example, it may comprise an electrically driven conveyor that displaces the fabric, a linear actuator with stepper motor for making the device travelling along a rail, a pneumatic driven system, etc.

[0031] The swiping element is adapted to rub the loose ends of edging material into the molten structure during the sliding movement. Thus, due to the sliding movement the loose ends are pressed into the molten fibres, such that they stick in the molten structure and are fixed to the bottom side of the fabric after hardening of the molten fibres. The availability of a swiping element implies that the loose ends of edging material are not rubbed into the molten structure using one's fingers, but that a specific element is provided for this. The swiping element may be any element being adapted for rubbing the loose ends into the molten structure. For example, it may be a strip

of material having an elongated form, with a width according to the size of the molten zone and where the sliding movement occurs following the length direction of the swiping element. In a preferred embodiment, the material of the contact surface of the swiping element is chosen such that the molten fibres of the fabric do not stick to the surface of the swiping element.

[0032] The second aspect of the invention is advantageous compared to solutions known in the prior art, because of various aspects. Firstly, the swiping element allows to rub the loose ends into the molten structure without direct contact of one's fingers with the molten structure. This lowers the risk of burns and prevents that a varying quality is obtained due to manual rubbing. Moreover, the swiping element allows to spread out the molten fibres of the fabric, such that a larger zone of molten material is obtained in which the loose ends of edging material may be fixed along their whole length. This results in a better quality, where all the loose ends are strongly fixed, thereby preventing fraying of the fabric edge. Furthermore, as the heating element is adapted to melt a whole zone at the bottom side of the fabric, not only fibres of the fabric itself are melted, but also some edging material may be melted. This implies that, considering a serged edge, some loops, in particular close to the corner of the fabric, may be fixed due to melting and hardening. As such, pivoting of those loops during use of the fabric is prevented, thereby contributing to a long-lasting edge of high quality.

[0033] Another advantage is that the device allows to obtain a visually attractive result. Indeed, as during use of the device only fibres at the bottom side of the fabric are molten, and the loose ends are fixed to the bottom side, the top side remains unaffected and no seam occurs at the side of the fabric. Therefore, the device does not affect the part of the fabric being visible for the user. Moreover, an inaccurate positioning of the fabric while doing the finishing with the device does not affect the visual result for the user, as a non-straight fixing is only visible at the bottom side of the fabric.

[0034] Another advantage is that the heating element and the swiping element are two distinctive elements. Therefore, the heating element may be chosen in function of the heating function, e.g. heating the bottom side in an indirect way, while the swiping element may be chosen in function of the rubbing function, e.g. preventing sticking of the molten fibres to the surface of the swiping element. Therefore, the swiping element may be a simple element in a common material, e.g. a rubber or silicone strip. As such, no special coatings, provided on a heated metal to prevent sticking of the molten fibres to the metal serving as heating source, are required. This contributes to a simple and cheap solution.

[0035] Finally, the driving element allows for an automatic establishment of the sliding movement. Such an automation contributes to a reduced labour cost as less manpower is needed.

[0036] Optionally, the device comprises a positioning

element, the swiping element being attached to the positioning element, and the positioning element being adapted to move the swiping element such that it is slid over the top side and the edge of the fabric, while bringing the swiping element to a position adapted for the sliding movement. Thus, the swiping element is attached to a positioning element. The positioning element is driven such that it may be moved, thereby also moving the sliding element being attached to it. During that movement, the swiping element may be first slid over the top side of the fabric, and next over the edge of the fabric. The movement ends in a position being adapted for the sliding movement between the swiping element and the bottom side of the fabric. Sliding the swiping element over the top side and the edge of the fabric has the advantage that loose ends lying on top of the fabric or being situated at the side of the fabric are brought to the bottom side of the fabric before the sliding movement for fixing the loose ends starts. This contributes to a better resulting quality. Moreover, the positioning element allows to establish a continuous movement of the swiping element, resulting in an efficient process.

[0037] Optionally, the swiping element comprises a strip of flexible material. A flexible material is defined as a material that allows for an elastic deformation. This implies that after deformation of the swiping element, it returns back to its initial form again when a load is removed. Moreover, in a preferred embodiment, the flexible material is durable, in the sense that it does not break after multiple deformations. Examples of flexible material are rubber, silicone, elastic and other stretchy materials, foam, spring steel, a leaf spring, etc. The use of a flexible material for the swiping element allows that the form of the swiping element can easily be changed, e.g. from an extend to a bent or folded condition, during operation of the device. For example, the swiping element may first be slid over the top side of the fabric in extended condition, and next be bent around the edge for bringing loose ends of material towards the bottom side of the fabric. Therefore, a single element may be used for different actions, contributing to a cheaper solution and allowing to obtain a qualitative result.

[0038] Optionally, the swiping element comprises a material adapted to prevent adhering of the molten structure to the swiping element. This implies that the whole swiping element is provided in a specific material, or that only part of the swiping element, e.g. only the contact surface, is provided in a specific material. This specific material is chosen such that the molten fibres do not stick to the swiping element during the sliding movement between the swiping element and the bottom side of the fabric. Moreover, the material used in the swiping element needs to resist the heat, i.e. its structure may not be affected by the heat present in the molten zone at the bottom side of the fabric. For example, the swiping element is made of silicone, rubber, foam, etc., or it comprises a top layer in e.g. teflon or another coating.

[0039] Optionally, the swiping element comprises one

or more of the following materials: rubber, silicone, foam, teflon, an anti-adhesive coating.

[0040] Optionally, the device further comprises a pressing element adapted to press the molten structure onto the swiping element, the swiping element being positioned on a supporting element, whereby the supporting element is comprised in the positioning element. The pressing element may e.g. be a stamp, which is pushed onto the fabric in a direction substantially perpendicular to the surface of the fabric. The pressing element may be used to, after the sliding movement has finished, press the fabric onto the swiping element. This has the advantage that the loose ends of edging material are additionally pressed into the molten fibres, such that a better fixing of the loose ends is obtained. Moreover, also the molten edging material is pressed, such that adjacent loops may stick together. This contributes to a better quality and durability of the obtained edge.

[0041] During the pressing by the pressing element, the swiping element is positioned on a supporting element. The supporting element is comprised in the positioning element. This implies that the positioning element is not only used to bring the swiping element to the position adapted for the sliding movement, but it also has a component serving as supporting element. The supporting element may e.g. be a flat surface comprised in the positioning element. During pressing with the pressing element, the swiping element rests on that flat surface. This implies that during the movement of the positioning element, the supporting element is automatically brought in the right position for pressing. This contributes to a reduced complexity of the device, and an efficient process.

[0042] Optionally, the heating element is movable. This implies that some actuator is available to move the heating element. This allows the heating element to be brought close to the bottom side of the fabric during heating, while during other steps of the process, the heating element may be retracted. This removes the risk that the fabric would catch fire, e.g. when the fabric is not timely removed from the device or the heating element erroneously keeps providing heat.

[0043] Optionally, the device comprises a pair of heating elements and a pair of positioning elements, each of them being installed symmetrically to a vertical axis perpendicular to the surface of the fabric. Thus, the device has two heating elements, e.g. both heating elements installed at an inclined direction relative to the surface of the fabric, and being each other's mirror image relative to the vertical axis perpendicular to the surface of the fabric. Similarly, the device has two positioning elements, e.g. both positioning elements installed at an inclined direction relative to the surface of the fabric, and being each other's mirror image relative to the vertical axis perpendicular to the surface of the fabric. Such a pair of heating elements and a pair of positioning elements allows to use the first heating resp. positioning element for finishing the end corner of the edge of a first carpet, while

the second heating resp. positioning element are used for finishing the start of the edge of a subsequent carpet. This contributes to an efficient process, where time is saved because the angle of the heating resp. positioning element does not need to be changed in between two fabrics.

[0044] According to a third aspect of the present invention, one or more of the above identified objectives are realized by an apparatus for finishing an edged fabric, the apparatus comprising:

- a device according to one of the preceding claims;
- a feeding system adapted to feed the edged fabric to the device;
- a detection system adapted to visually detect the edge of said fabric;
- a displacement system adapted to displace said fabric or said device according to said edge detected by said detection system.

[0045] A feeding system e.g. comprises a conveyor or driven belts to transport the fabric towards the device. A detection system is for example a camera, one or more sensors, etc. The detection system allows to detect how the edge or corner of the fabric is positioned relative to the device. Next, a displacement system may be used to adapt the position of the fabric or the position of the device in longitudinal and/or in transverse direction. For example, a conveyor system may be used to move the fabric in longitudinal direction, or the device may be moved in longitudinal and/or transverse direction using an electric motor and actuator. This has the advantage that the edge or corner of the fabric is accurately positioned relatively to the device before starting the finishing process, thereby contributing to a better obtained quality.

Brief Description of the Drawings

[0046]

Fig. 1 gives a conceptual figure of an edged fabric, where serging was used as edging method.

Fig. 2 gives a conceptual figure of two fabrics, being sequentially serged, and still connected by threads of edging material.

Fig. 3 illustrates the loose ends of edging material, obtained after cutting the threads of edging material between two fabrics.

Fig. 4 illustrates how loops of edging material may tend to pivot around the corner of the fabric, before they are fixed using the invented method or device.

Fig. 5a and Fig. 5b illustrate the consecutive steps in a method according to an embodiment of the invention.

Fig. 6 illustrates the consecutive steps in a method according to another embodiment of the invention.

Fig. 7a, Fig. 7b and Fig. 7c show respectively a three-dimensional view, a front view and a side view of a device according to an embodiment of the invention, where the device is in an initial state.

Fig. 8 gives a three-dimensional view of a device according to an embodiment of the invention.

Fig. 9a and Fig. 9b show respectively a front view and a side view of a device according to an embodiment of the invention, where the device is in a state corresponding to the heating step.

Fig. 10 shows a front view of a device according to an embodiment of the invention, where the device is in a state at the end of the preparation step.

Fig. 11a and Fig. 11b respectively show a front view and a cross section of a device according to an embodiment of the invention, where the device is in a state corresponding to the swiping step.

Fig. 12 shows a front view of a device according to an embodiment of the invention, where the device is in a state corresponding to the pressing step.

Fig. 13a and Fig. 13b show respectively a three-dimensional view and a front view of an apparatus according to an embodiment of the invention.

Detailed Description of Embodiment(s)

[0047] Fig. 1 gives a conceptual figure of an edged fabric 100. The fabric 100 may e.g. be a rug or a carpet, e.g. a tufted or woven carpet, a wall to wall carpet, a carpet runner, etc. In order to prevent fraying of the edges 102, the fabric 100 has been edged. In the case of Fig. 1, serging was used as edging method. Fig. 1 show that a continuous wrap of yarn, e.g. Polyamide or Polypropylene, is provided around the edge 102, comprising a series of loops 101.

[0048] Fig. 2 illustrates how two fabrics 100, 200 are sequentially edged in a continuous process. First the short edge 102 of the first fabric 100 is edged, next the short edge 202 of the second fabric 200 is edged. Due to the continuous edging process, the two fabrics are connected by threads of edging material 204. After serging, the threads of edging material 204 are cut, as is indicated by 203 in Fig. 2.

[0049] Fig. 3 shows how after cutting the threads of edging material 204, loose ends of edging material 300 are obtained. The loose ends 300 may comprise one or more individual threads of edging material. The loose ends 300 need to be fixed, in order to prevent fraying of the edging material. Fig. 4 illustrates how, before finishing

the edged fabric using the invented device or method, some loops of edging material 101 may tend to pivot around the corner of the fabric 101, see 400. Using the method according to the invention allows to fix both the loose ends of edging material 300 as the loops 101 tending to pivot around the corner of the fabric.

[0050] In another embodiment, another edging method, e.g. binding, stitching, ..., may be used instead of serging. The loose ends of edging material 300 may then refer to loose ends of sewing thread or loose ends of binding material, where the sewing thread and/or binding material were used for binding the edge of a fabric

[0051] Fig. 5a and Fig. 5b illustrate the consecutive steps in a method according to an embodiment of the invention, for finishing an edged fabric 100. In order not to overload the figures, the loose ends of edging material 300 are not drawn. The figures show that a swiping element 500 and a positioning element 501 are provided. In the shown embodiment, the swiping element 500 is a strip of flexible material, e.g. a strip of silicone or rubber. The swiping element 500 is on one side attached to the positioning element 501. As shown in the first step of the figure, the swiping element may tend to sag a bit under its own weight, due to the use of flexible material. In an embodiment the stiffness of the swiping element may be increased by using e.g. a leaf spring.

[0052] During the heating step 501, a heating element 502 is used to heat a zone at the bottom side 508 of the fabric 100. The heating element 502 may e.g. be a device blowing hot air, where the heat is created with electrical resistances. Due to the heat, a zone of molten fibres is obtained at the bottom side 508 of the fabric 100.

[0053] Next, during the initial preparation step 502, the positioning element 501 is moved downwards. Due to the downward movement of the positioning element 501, the swiping element 500 is slid over the top side 509 of the fabric 100, thereby bringing loose ends 300 initially lying at the top side 509 of the fabric 100 towards the edge 510. During the initial preparation step 502, the swiping element 500 is in an extended condition, meaning that it has an elongated shape. Next, during the preparation step 503, loose ends 300 at the side of the fabric 100 are moved towards the bottom side 508, as the swiping element 500 is slid over the edge 510 of the fabric 100. During the preparation step 503, the swiping element 500 is in a bent condition.

[0054] During the following step, the swiping step 504, the fabric 100 is shifted to the right side on Fig. 5a. Doing so, the fabric 100 brings the swiping element 500 in a folded condition, and the bottom side 508 of the fabric 100 is slid over the swiping element 500. Consequently, the swiping element 500 spreads out the molten fibres and rubs the loose ends 300 of edging material into the molten zone. After hardening of the molten material, the loose ends 300 are securely fixed to the bottom side 508 of the fabric. Moreover, as also part of the loops 101 of edging material are molten in the heating step 501, they remain fixed after hardening, preventing the pivoting 400

as shown in Fig. 4. As the molten structure is situated at the bottom side 508 of the fabric 100, the parts of the fabric 100 being visible for users remain unaffected.

[0055] Next, during the pressing step 505, 506, a pressing element 507, e.g. a stamp, is used to press the fabric 100 onto the swiping element 500. During the pressing step 505, 506 the pressing element 507 moves downwards, while the swiping element 500 and the fabric 100 remain in the position as was reached at the end of the swiping step 504. The pressing step 505, 506 allows to additionally press the loose ends 300 of edging material into the molten zone at the bottom side 508 of the fabric 100, thereby contributing to a better adhesion.

[0056] In Fig. 6, another embodiment of a swiping step 604 is illustrated, where the positioning element 501 and the swiping element 500 are shifted while the fabric 100 does not move. In this embodiment, the swiping element 500 slides over the molten structure at the bottom side 508 of the fabric 100, thereby rubbing the loose ends 300 into the molten zone.

[0057] In other embodiments of the method, no initial preparation step 502 and/or preparation step 503 and/or pressing step 505, 506 may occur, or they may be executed in another way. Moreover, in other embodiments no positioning element 501 may be used, or the positioning and/or sliding of the swiping element 500 may be established in another way than illustrated in Fig. 5a and Fig. 6.

[0058] Fig. 7a, Fig. 7b and Fig. 7c show respectively a three-dimensional view, a front view and a side view of a device 700 according to an embodiment of the invention, where the device 700 is in an initial state. The device 700 is adapted to finish the edge corner 704 of a first fabric 100 and the edge corner 705 of a second fabric 200. For this purpose, the device 700 comprises a pair of positioning elements 501, 701, a pair of heating elements 502, 702, swiping elements 500, 707, and a single pressing element 507. The heating elements 502, 702 and positioning elements 501, 701 are adapted to move following an inclined direction relative to the surface of the fabric 100, 200. For finishing the edge corner 704, the steps of Fig. 5 are executed using the heating element 502, the positioning element 501, the swiping element 500 and the pressing element 507. For finishing the edge corner 705, the steps of Fig. 5 are executed using the heating element 702, the positioning element 701, the swiping element 707 and the pressing element 507. The availability of a pair of positioning elements 501, 701 and a pair of heating elements 502, 702 allows to consecutively finish the corners 704 and 705, without intermediately having to change the angle of the heating element and positioning element.

[0059] Fig. 7b gives a close view of the positioning elements 501, 507. The positioning element 501 comprises a supporting element 709, and a swiping element 500 is attached to the positioning element 501. A telescopic system 710 is adapted to move the positioning element 501 and the swiping element 500 towards the table 706. In

the embodiment of Fig. 7, the swiping element 500 comprises a strip of flexible material, e.g. a strip of rubber or silicone. Possibly, a leaf spring may be used to enhance the stiffness of the swiping element 500. In the initial state, the swiping element 500 is in an extended condition 713, i.e. it has an elongated shape. In Fig. 7, the representation of swiping elements 500, 707 is merely schematic; in a practical embodiment the swiping element 500, 707 may tend to sag a bit under its own weight due to the flexible material it is made of. As such, its shape may be somewhat curved instead of the straight shape shown in Fig. 7.

[0060] Fig. 7c shows that a telescopic arm 703 is available, which allows to move the positioning element 501 and the telescopic system 710 forward or backward. A similar telescopic arm is provided for the positioning element 701 and the telescopic system 712. Fig. 7c shows that in the initial state both systems 710 and 712 are aligned, while Fig. 9b shows that during finishing of the edge corner 704, the system 712 is in a more backward position relative to the system 710. This configuration is kept during the heating step, (initial) preparation step, swiping step and pressing step for the edge corner 704. Next, during finishing of the edge corner 705 the configuration is changed, where the system 710 is in the more backward position.

[0061] The three-dimensional view of Fig. 8 shows the table 706 on which the fabric corners 704, 705 are positioned during finishing. In particular, the figure shows that the table 706 has a hole 800. The hole 800 allows that the positioning element 501 moves to a position underneath the surface of the fabric 100, as is shown in Fig. 10 and will further be described underneath.

[0062] Fig. 9a and Fig. 9b show the device 700 in a state according to the heating step 501. Fig. 9a shows that the heating element 502 is pushed upwards, towards the corner 704 of the fabric 100, by a telescopic piston 900. In the embodiment of Fig. 9, the heating element 502 blows hot air when being in the upward position, the air being heated using electrical resistors. In another embodiment, another type of heating element may be used, e.g. UV heating, a heated stamp, etc. The provided heat results in a zone of molten fibres at the bottom side of the fabric 100. After the heating step 501, the heating element 503 is moved back again to its original position, as is clear from Fig. 10.

[0063] Fig. 10 shows how the telescopic system 710 is used to move the positioning element 501 downwards, towards the fabric 100, throughout the hole 800. This movement is done during the initial preparation step 502 and subsequent preparation step 503. By moving the positioning element 501, also the thereto attached swiping element 500 is moved. This causes the swiping element 500 to slide over the top surface of the fabric 100 during the initial preparation step 502, not visible on Fig. 10. During the initial preparation step 502, the swiping element 500 is still in an extended condition 713. Next, the swiping element 500 slides along the edge of the fabric

100 during the preparation step 503, thereby being brought in a bent condition as is indicated by 1000 in Fig. 10.

[0064] Fig. 11a and Fig. 11b respectively show a front view of the device 700, in a state corresponding to the swiping step 504. Compared to the representation of Fig. 10, the fabric 100 has been shifted to the right side. This movement is established by means of a driving element, in the shown embodiment provided as a driven belt system 1303, 1304 and servomotor 770. Fig. 13a and Fig. 13b show how a driven belt system 1303, 1304 allows to displace the fabric 100 in longitudinal direction, the latter being indicated as the X-direction on Fig. 13 a. Moreover, the device 700 may be displaced in longitudinal direction along a rail 1301 using a servomotor 770. At the time of the swiping step 504, the fabric 100 moves faster than the device 700, thereby bringing the swiping element 500 in a folded condition 1100.

[0065] In the folded condition 1100 of the swiping element 500, part of it slides over the molten zone at the bottom side of the fabric 100. The folded condition 1100 is further made clear from the detailed cross section of Fig. 11b. Fig. 11b shows that the swiping element 500, being a flexible strip, is folded around the block 1101 of the positioning element 501. The end of the flexible strip is positioned on the supporting element 709. The supporting element 709 is a flat surface comprised in the positioning element 501. In the state of Fig. 11b, the supporting element 709 is substantially parallel to the surface of the fabric 100. Fig. 11b also shows that during the sliding movement of the swiping step 504, contact is being made between the bottom side of the fabric 100 and the part of the swiping element 500 being positioned on the supporting element 709. As such, the swiping element 500 rubs the loose ends 300 of edging material into the molten zone at the bottom side of the fabric. In the shown embodiment, the swiping element 500 is made of rubber or silicone, such that its contact surface, making contact with the molten zone, does not stick to the molten fibres.

[0066] Fig. 12 shows a front view of the device 700 in a state corresponding to the pressing step 505, 506. A pressing element 507, e.g. a stamp, is moved downwards by means of a telescopic system 711. The swiping element 500 is still in the folded condition 1100 of Fig. 11b, where the end part is positioned on the supporting element 709. The pressing element 507 is pushed onto the fabric 100, such that the molten zone at the bottom side is pressed onto the swiping element 500 resting on the supporting element 709. This results in an additional fixation of the loose ends of edging material 300 in the molten zone. After having completed the pressing step 505, 506, the pressing element is brought back in its initial state again, using the telescopic system 711. Similarly, the positioning element 501 is brought back in its initial state again, using the telescopic system 710. Afterwards, a next cycle may start, in which the edge corner 705 is finished.

[0067] Fig. 13a and Fig. 13b show respectively a three-dimensional view and a front view of an apparatus 1300, comprising the device 700. The longitudinal direction is indicated as 'X' on Fig. 13a and the transverse direction as 'Y'. A feeding system, comprising a driven belt system 1303 above and a driven belt system 1304 underneath, allows to feed fabrics to the device 700 in longitudinal direction. The fabrics may be partly rolled up, where the roll is positioned in a delineated space 1305, while the unrolled part, including the edge corner to be finished is positioned in the area of the device 700.

[0068] The device 700 may be linearly displaced along a rail 1301, using a servomotor motor 707 and linear actuator. The device 700 may travel along the rail 1301 to move towards the edges between two consecutive fabrics. As described above, during the swiping step 504, the fabric 100 moves faster in longitudinal direction than the device 700, thereby bringing the swiping element 500 in the folded condition 1100.

[0069] Optionally, the apparatus 1300 may comprise a detection system, e.g. a camera which allows to visually detect the edge or corner of the fabric. In function of the detected edge or corner, the relative position of the fabric 100 may be adapted in longitudinal and/or transverse direction, using a displacement system. In the embodiment of Fig. 13, the fabric 100 may be displaced in transverse direction in function of the detected edge or corner, by means of an electric motor 708 and spindle 1302. Moreover, in longitudinal direction either the position of the fabric may be adapted using the belt system 1303, 1304, or the position of the device 700 may be adapted in longitudinal direction by means of the servomotor 770 and rail 1301.

[0070] Although the present invention has been illustrated by reference to specific embodiments, it will be apparent to those skilled in the art that the invention is not limited to the details of the foregoing illustrative embodiments, and that the present invention may be embodied with various changes and modifications without departing from the scope thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein. In other words, it is contemplated to cover any and all modifications, variations or equivalents that fall within the scope of the basic underlying principles and whose essential attributes are claimed in this patent application. It will furthermore be understood by the reader of this patent application that the words "comprising" or "comprise" do not exclude other elements or steps, that the words "a" or "an" do not exclude a plurality, and that a single element, such as a computer system, a processor, or another integrated unit may fulfil the functions of several means recited in the claims. Any reference signs in the claims shall not be construed as limiting the respective

claims concerned. The terms "first", "second", "third", "a", "b", "c", and the like, when used in the description or in the claims are introduced to distinguish between similar elements or steps and are not necessarily describing a sequential or chronological order. Similarly, the terms "top", "bottom", "over", "under", and the like are introduced for descriptive purposes and not necessarily to denote relative positions. It is to be understood that the terms so used are interchangeable under appropriate circumstances and embodiments of the invention are capable of operating according to the present invention in other sequences, or in orientations different from the one(s) described or illustrated above.

Claims

1. A method for finishing an edged fabric (100) comprising one or more loose ends (300) of cut edging material, said method comprising:
 - a heating step (501), comprising heating the bottom side (508) of said fabric (100), resulting in a molten structure;
 - a swiping step (504), comprising sliding a swiping element (500) and said bottom side (508) of said fabric (100) over each other, thereby rubbing said loose ends (300) into said molten structure by said swiping element (500).
2. A method according to claim 1, whereby said method further comprises a preparation step (503) preceding said swiping step (504), said preparation step (503) comprising sliding said swiping element (500) and the edge (510) of said fabric (100) over each other, thereby moving said loose ends (300) towards said bottom side (508) of said fabric (100).
3. A method according to claim 2, whereby said method further comprises an initial preparation step (502) preceding said preparation step (503), said initial preparation step (502) comprising sliding said swiping element (500) and the top side (509) of said fabric (100) over each other, thereby moving said loose ends (300) lying at said top side (509) towards the edge (510) of said fabric (100).
4. A method according to claim 3, whereby said method comprises moving said swiping element (500) towards a position adapted for said swiping step (504), while doing said initial preparation step (502) and said preparation step (503).
5. A method according to claim 4, whereby said swiping element (500) changes from an extended condition (713) during said initial preparation

step (502), next to a bent condition (1000) during said preparation step (503), next to a folded condition (1100) during said swiping step (504).

6. A method according to one of the preceding claims, wherein said method further comprises a pressing step (505, 506), comprising pressing said molten structure onto said swiping element (500).
7. A device (700) for finishing an edged fabric (100) comprising one or more loose ends (300) of edging material, said device (700) comprising:
 - a heating element (502) adapted to heat the bottom side (508) of said fabric (100), resulting in a molten structure;
 - a swiping element (500) and a driving element (1303, 1304, 770), wherein said driving element (1303, 1304, 770) is adapted to establish a sliding movement of said swiping element (500) and said bottom side (508) of said fabric (100) over each other, said swiping element (500) being adapted to rub said loose ends (300) into said molten structure during said sliding movement.
8. A device (700) according to claim 7, wherein said device (700) comprises a positioning element (501), said swiping element (500) being attached to said positioning element (501), and said positioning element (501) being adapted to move said swiping element (500) such that it is slid over the top side (509) and the edge (510) of said fabric (100), while bringing said swiping element (500) to a position adapted for said sliding movement.
9. A device (700) according to claim 7 or 8, wherein said swiping element (500) comprises a strip of flexible material.
10. A device (700) according to claim 7 or 8 or 9, wherein said swiping element (500) comprises a material adapted to prevent adhering of said molten structure to said swiping element (500).
11. A device (700) according to claim 10, wherein said swiping element (500) comprises one or more of the following materials: rubber, silicone, foam, teflon, an anti-adhesive coating.
12. A device (700) according to claim 8, wherein said device (700) further comprises a pressing element (507) adapted to press said molten structure onto said swiping element (500), said swiping element (500) being positioned on a supporting element (709), whereby said supporting element (709) is comprised in said positioning element (501).
13. A device (700) according to one of the preceding

claims,
wherein said heating element (502) is movable.

14. A device (700) according to claim 8,
wherein said device (700) comprises a pair of heat- 5
ing elements (502, 702) and a pair of positioning el-
ements (501, 701), each of them being installed sym-
metrically to a vertical axis perpendicular to the sur-
face of said fabric (100). 10

15. An apparatus (1300) for finishing an edged fabric
(100), comprising:

- a device (700) according to one of the preced- 15
ing claims;
- a feeding system (1303, 1304) adapted to feed
said edged fabric (100) to said device (700);
- a detection system adapted to visually detect
the edge (102) of said fabric (100);
- a displacement system (708, 1302) adapted to 20
displace said fabric (100) or said device (700)
according to said edge (102) detected by said
detection system.

25

30

35

40

45

50

55

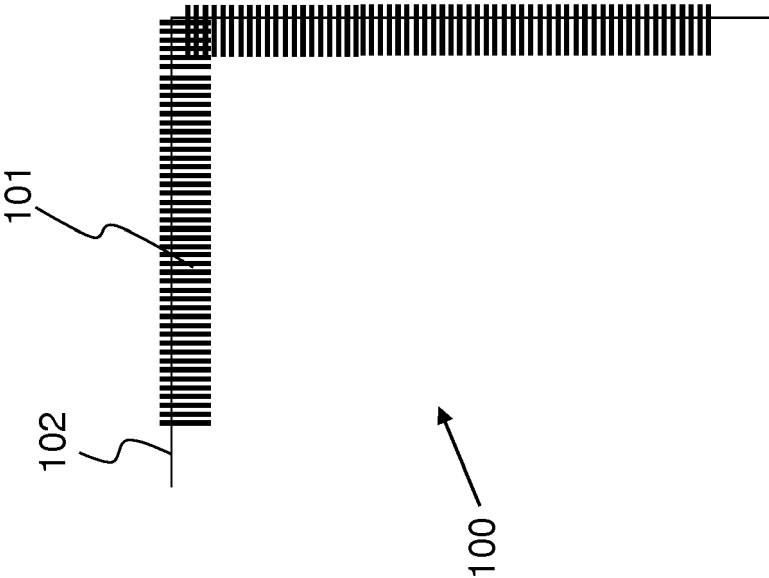
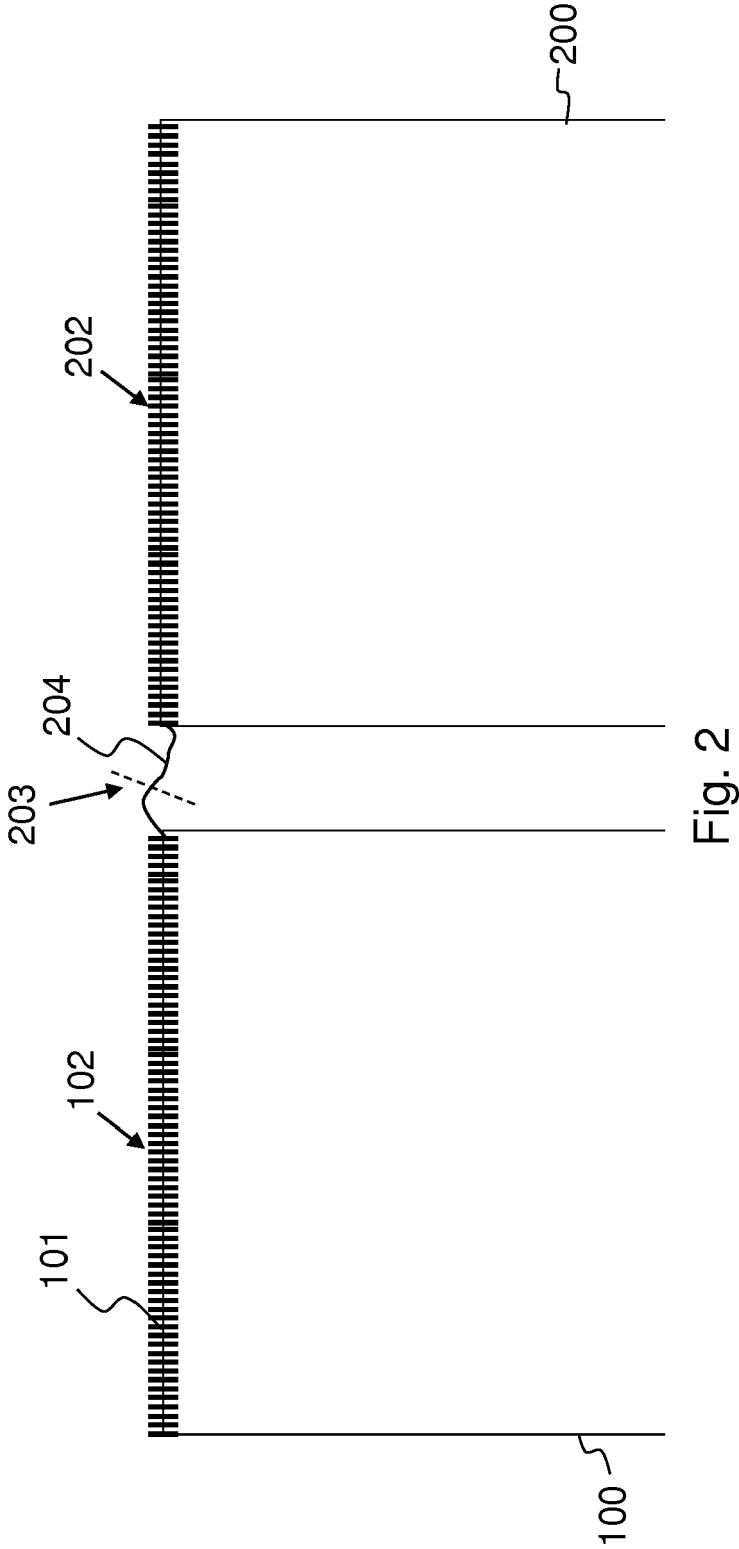


Fig. 1



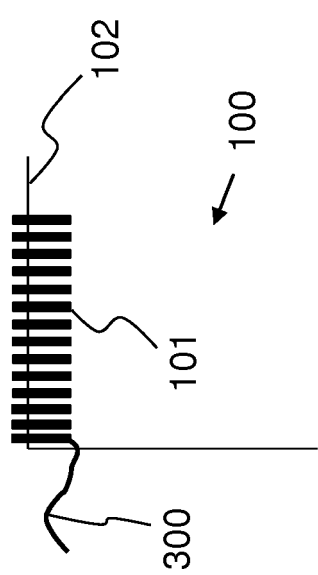


Fig. 3

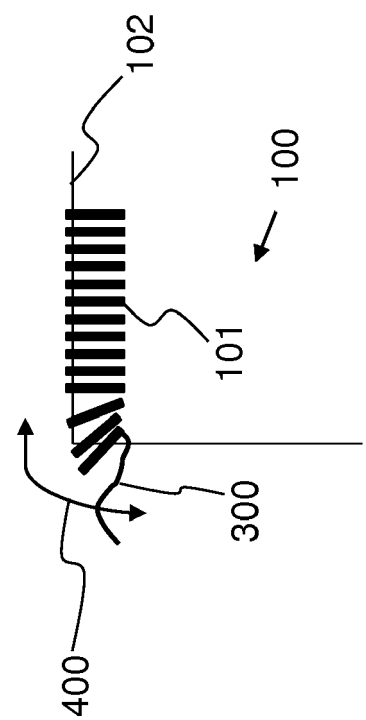


Fig. 4

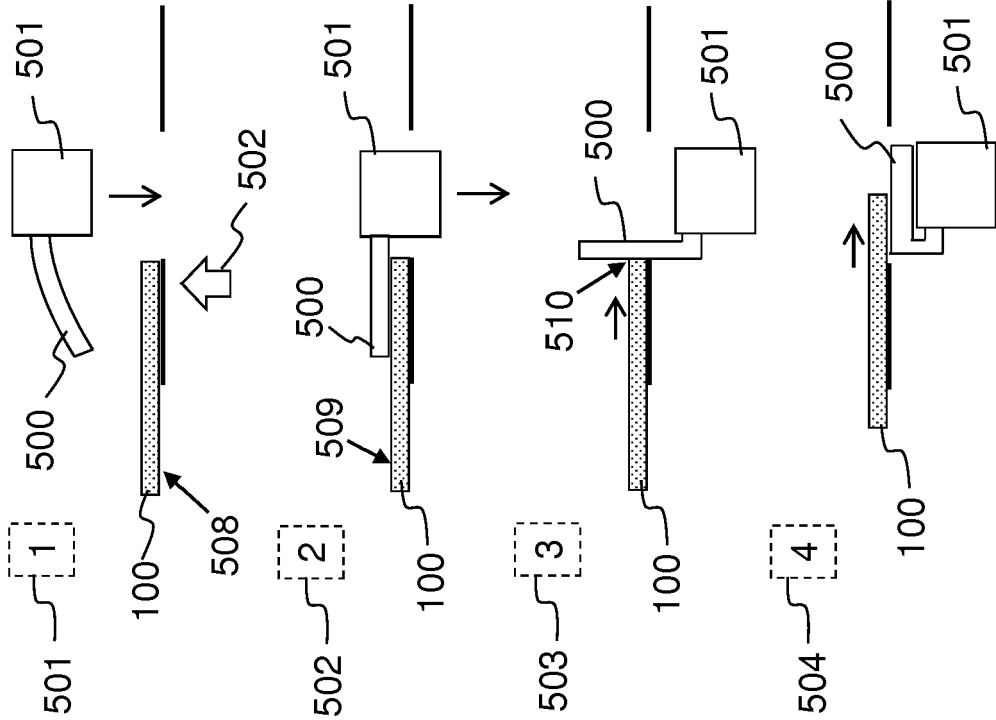


Fig. 5a

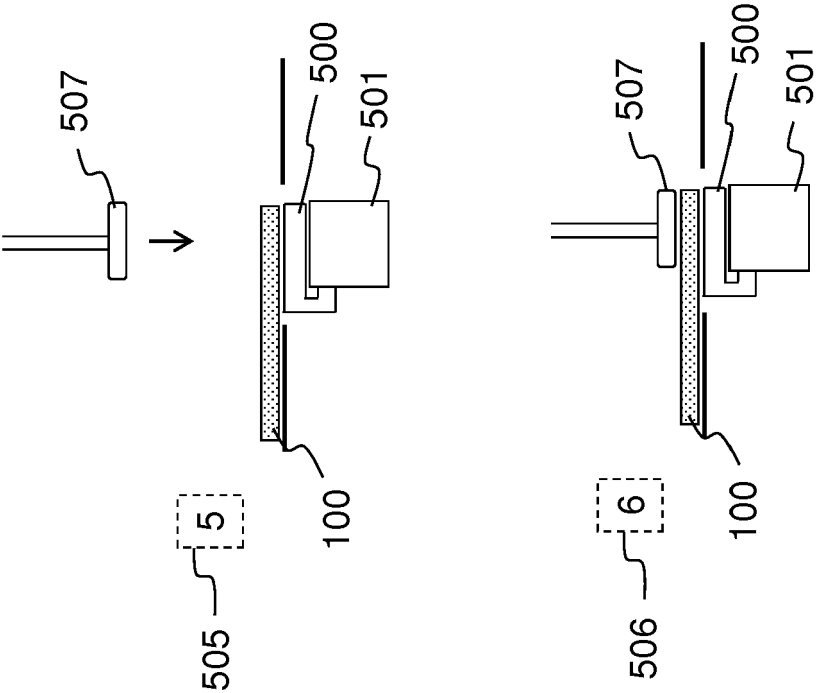


Fig. 5b

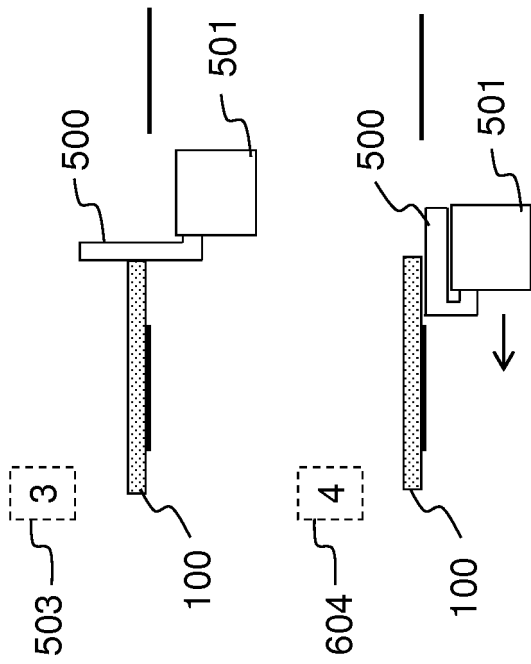
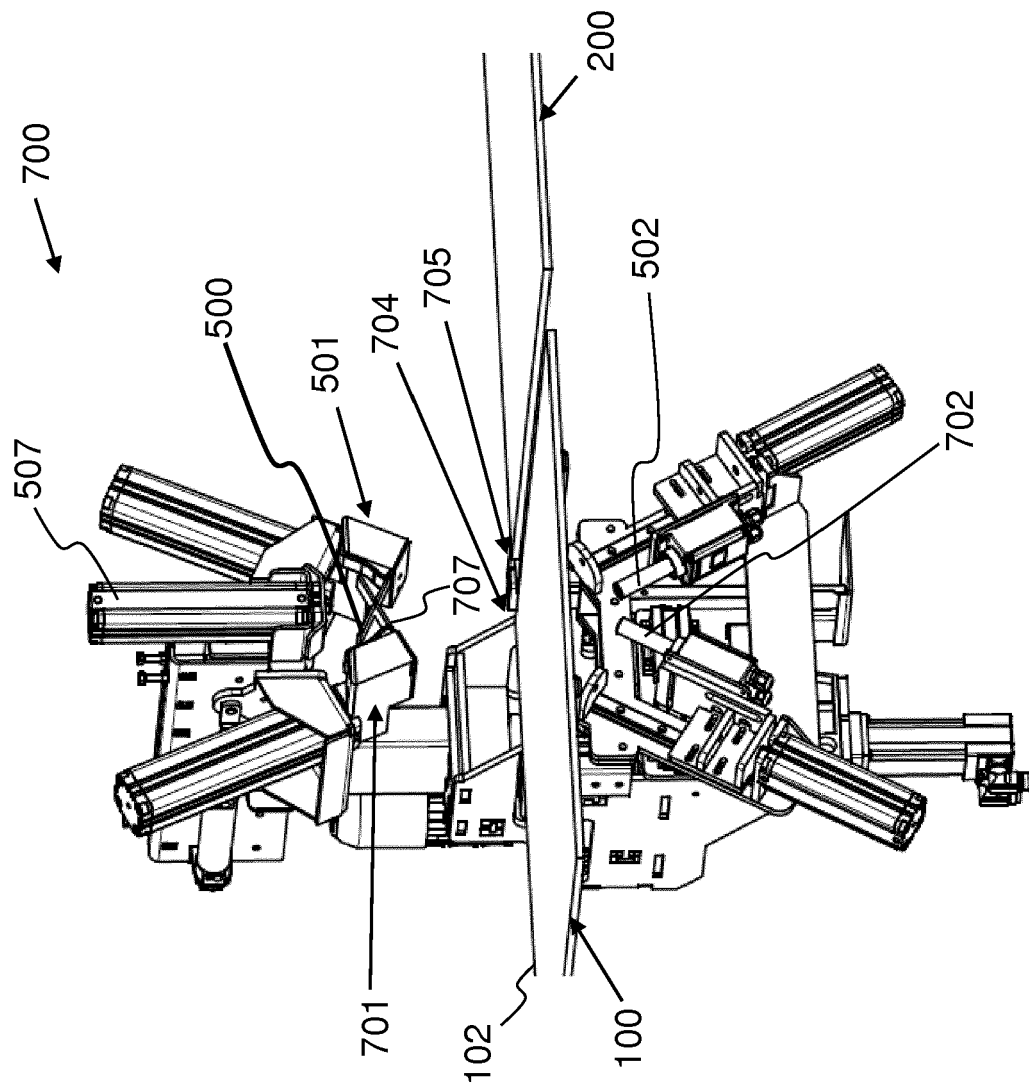


Fig. 6



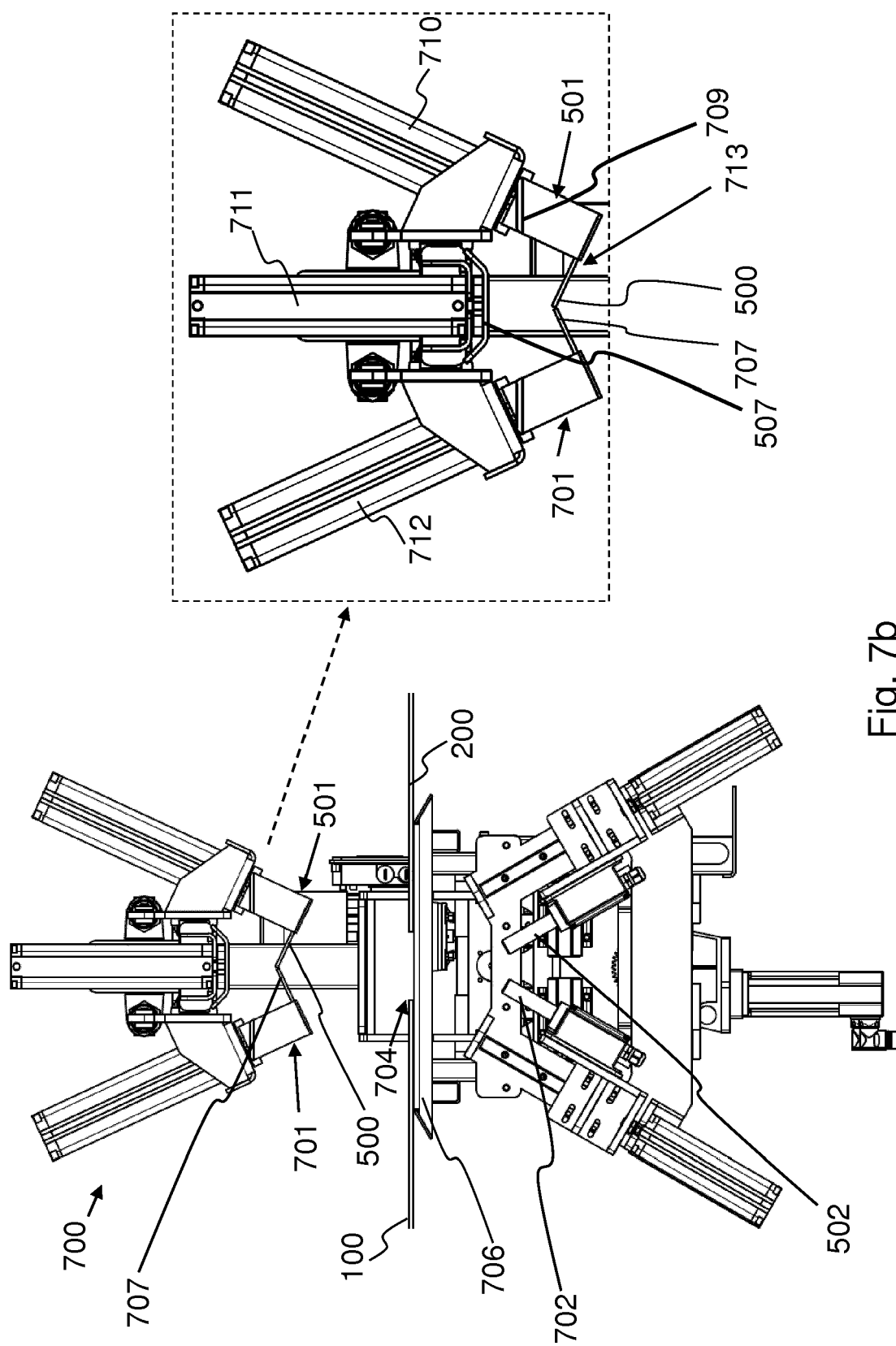


Fig. 7b

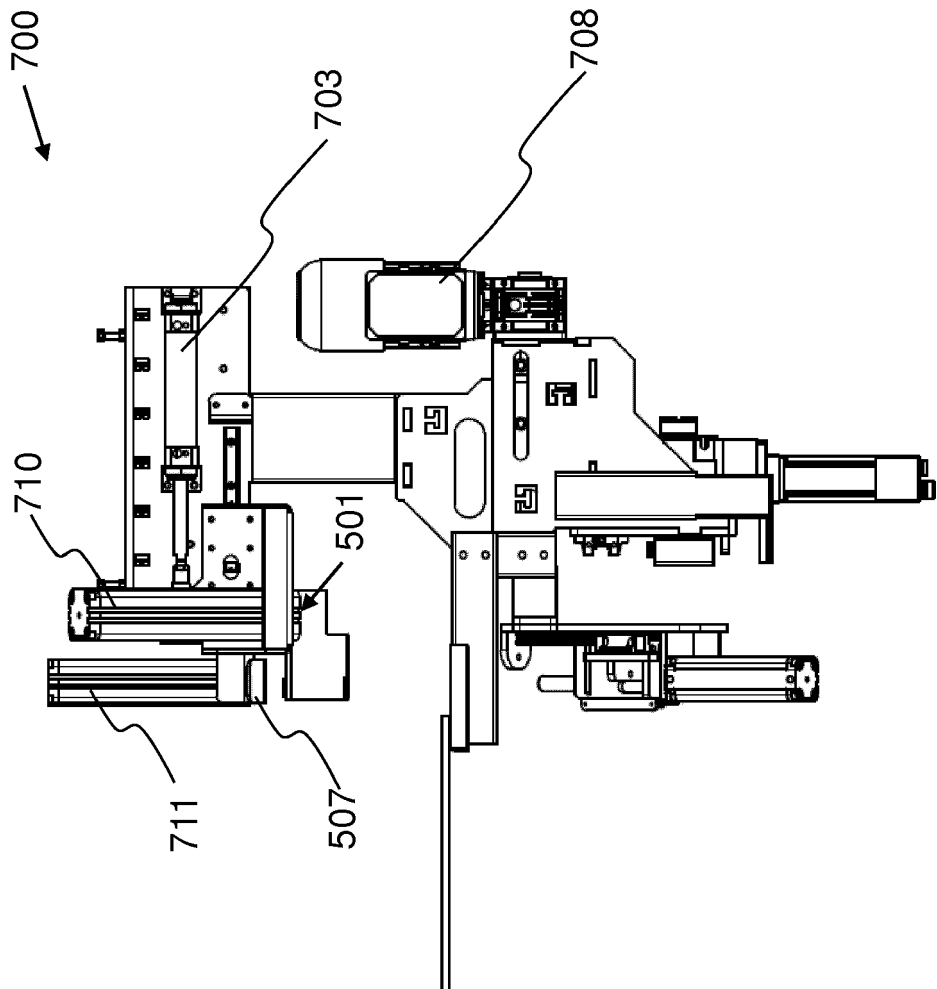


Fig. 7c

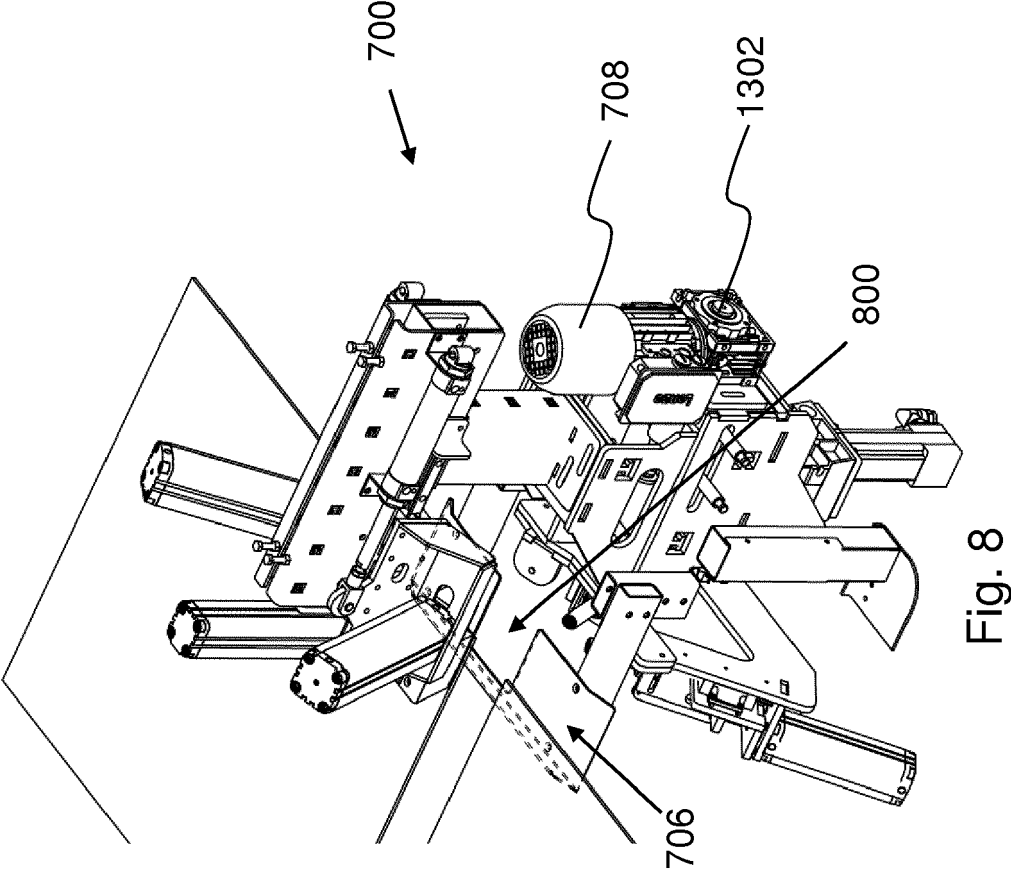


Fig. 8

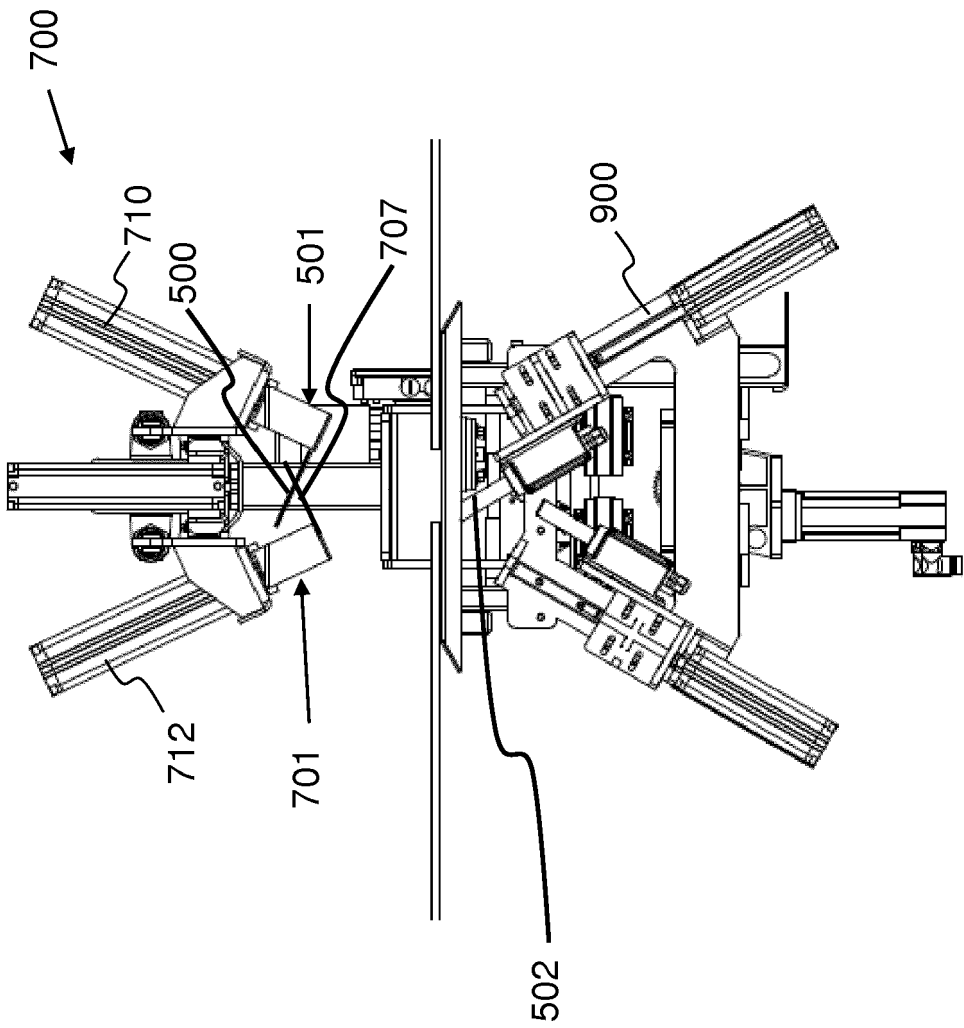
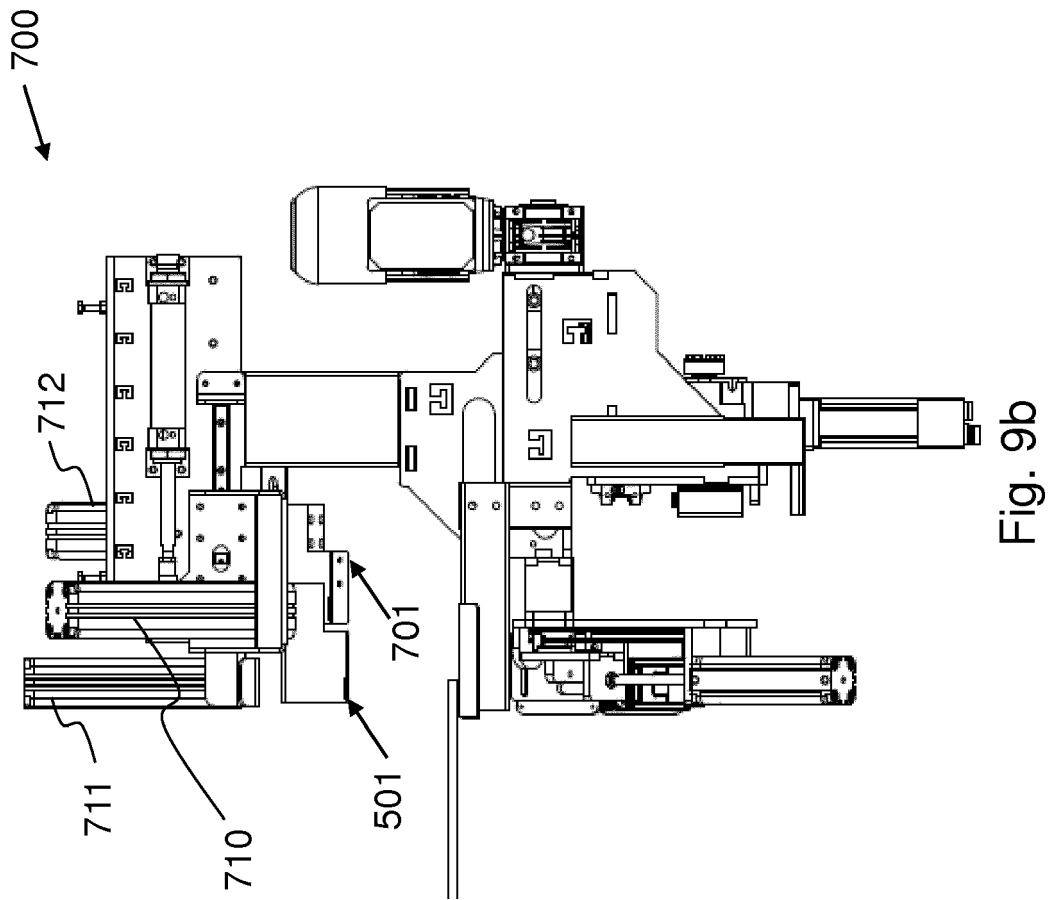


Fig. 9a



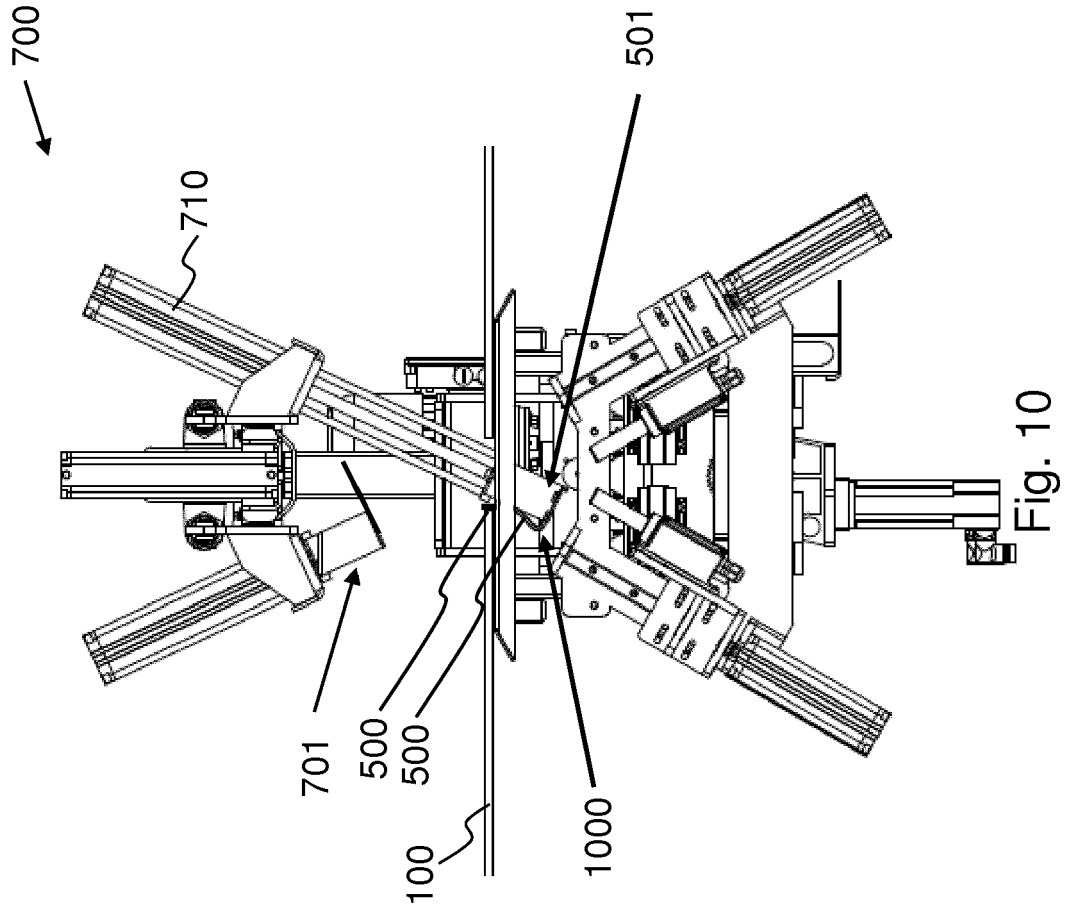


Fig. 10

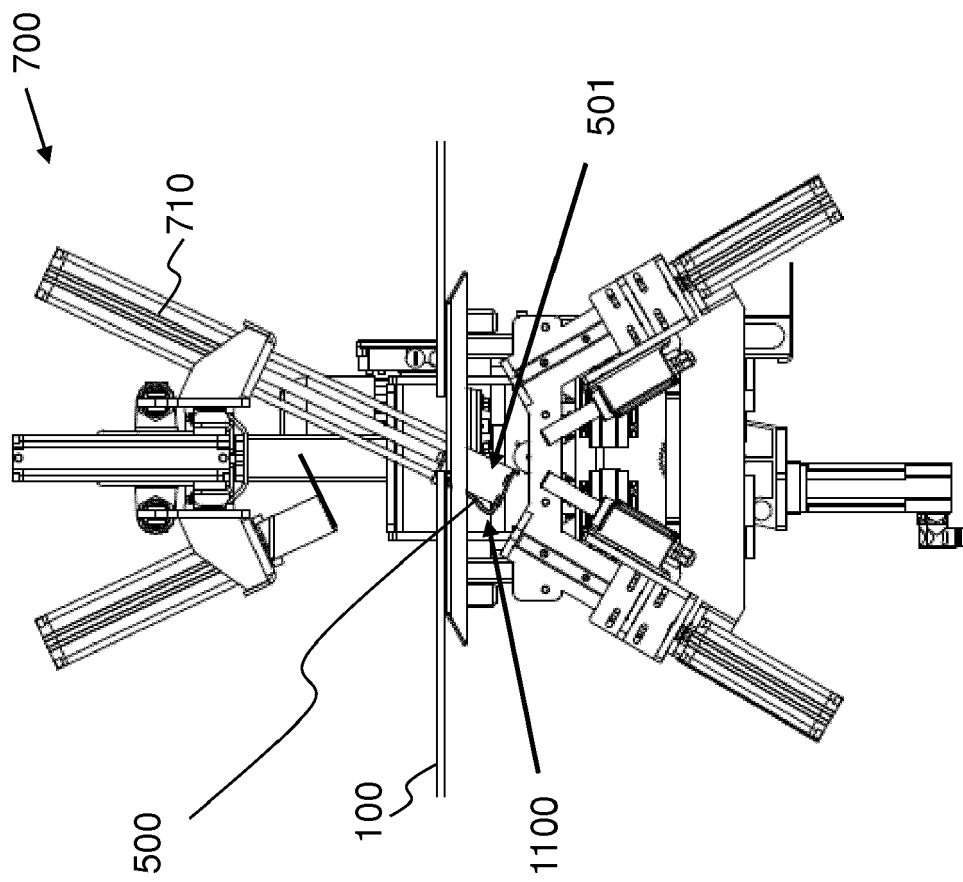
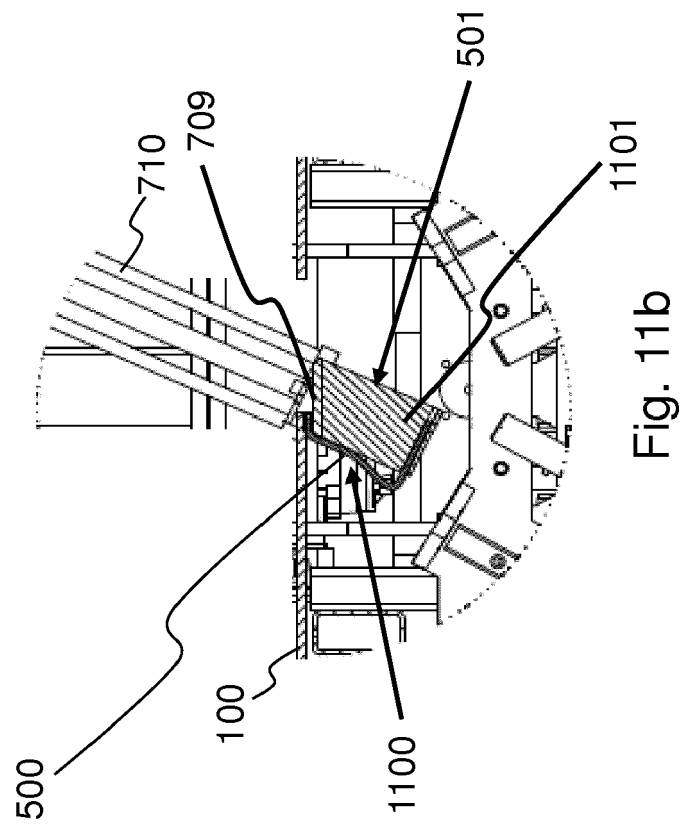


Fig. 11a



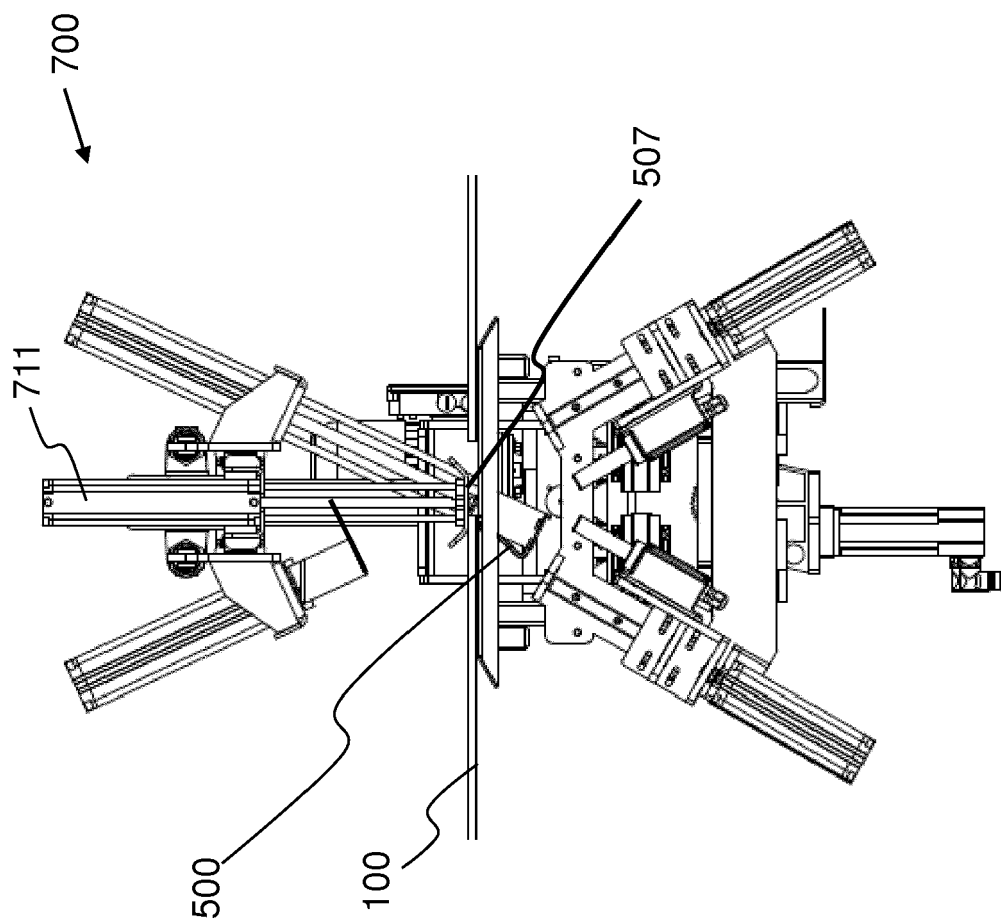
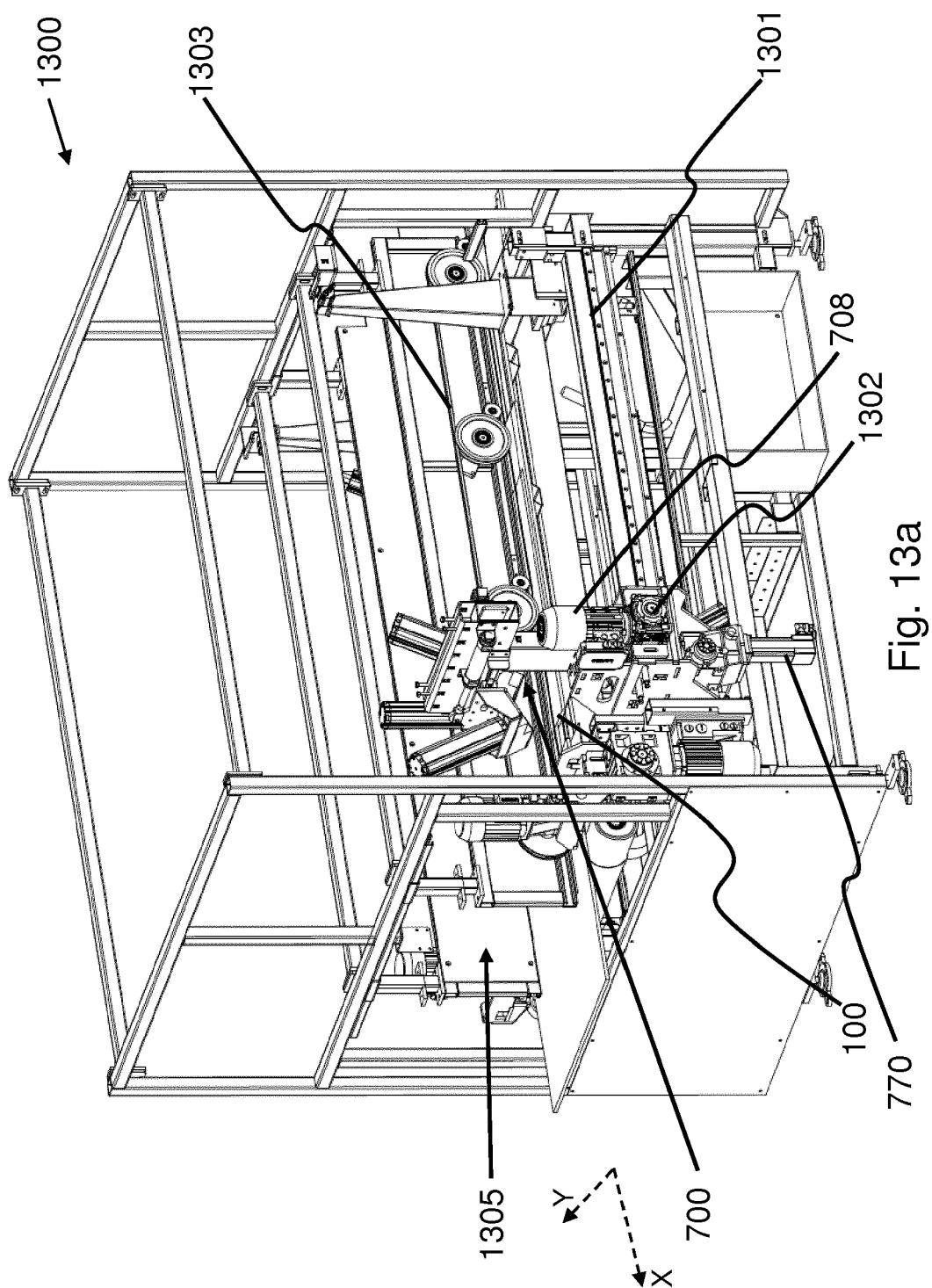


Fig. 12



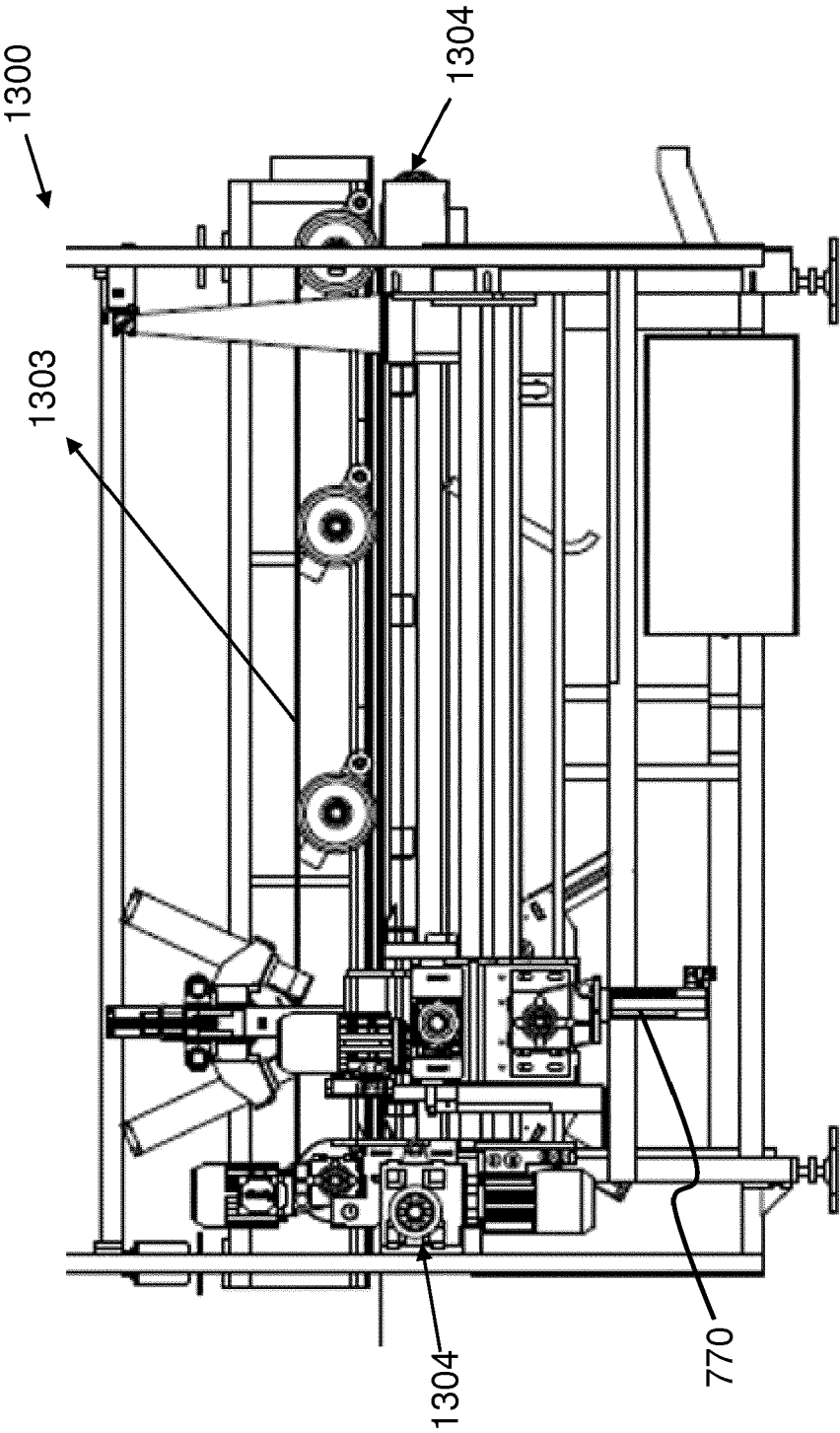


Fig. 13b



EUROPEAN SEARCH REPORT

Application Number
EP 19 20 1531

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	BE 1 017 433 A3 (EVILO NV [BE]) 2 September 2008 (2008-09-02) * claims 1-10; figures 1-10 *	1-15	INV. D06N7/00 A47G27/02 A47G27/04
A,D	BE 1 018 622 A5 (HANDSAEME MACHINERY BVBA [BE]) 3 May 2011 (2011-05-03) * the whole document *	1-15	B26D1/30 B26D7/27 B26F3/08 D06H7/22
A	WO 98/50618 A1 (ALTIN NAEHTECHNIK PROTOTYPING [DE]; RATTAY FRANK [DE] ET AL.) 12 November 1998 (1998-11-12) * claims 1-6; figures 1,2 *	1-15	D05B35/06 D05B65/06 D06C13/12 D05B23/00 D05B37/10
A	US 3 581 716 A (TEED RICHARD K) 1 June 1971 (1971-06-01) * figures 1-6 *	1-15	
A,D	WO 2005/021856 A1 (IBCOM NV [BE]; SAGAERT XAVIER [BE]) 10 March 2005 (2005-03-10) * the whole document *	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
			D06N B26F A47G B26D D06H D05B D06C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 18 March 2020	Examiner Barathe, Rainier
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 20 1531

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-03-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
BE 1017433	A3	02-09-2008	NONE
BE 1018622	A5	03-05-2011	NONE
WO 9850618	A1	12-11-1998	DE 19719372 A1 12-11-1998 EP 1015680 A1 05-07-2000 TW 373043 B 01-11-1999 WO 9850618 A1 12-11-1998
US 3581716	A	01-06-1971	NONE
WO 2005021856	A1	10-03-2005	AU 2003302289 A1 16-03-2005 WO 2005021856 A1 10-03-2005

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- BE 20080704 [0006]
- WO 2005021856 A [0007]