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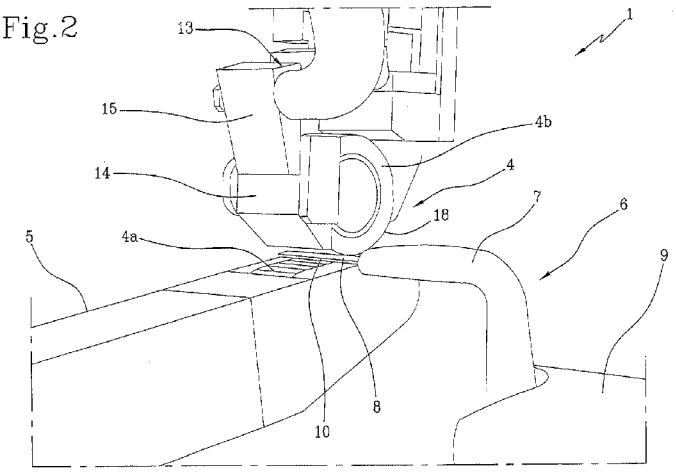
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(54) **Title**: HEAT-SEALING MACHINE FOR ASSEMBLING TEXTILE ARTICLES OF MANUFACTURE AND METHOD ACHIEVED BY THE SAME

Fig.2



(57) **Abstract**: A heat-sealing machine for assembling textile articles of manufacture comprises a conveying group comprising a first conveying member co-operating with a second conveying member for translation of an article of manufacture being worked in a predetermined feeding direction, said article of manufacture comprising at least one first and one second layer adapted to be interposed between said first and second conveying members in a region of mutual junction of the layers themselves, and a heating unit operating in the region of the conveying group for determining activation of at least one thermoadhesive element carried by at least one of the layers on a side thereof facing the other layer in the region of mutual junction. The heating unit comprises a heat dispenser adapted to operate between the first and second layers so as to direct a thermal carrier flux directly against the thermoadhesive element.

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Description

Heat-sealing machine for assembling textile articles of manufacture and method achieved by the same

Technical Field

The present invention relates to a heat-sealing machine for assembling fabrics, of the type comprising the characteristic features expressed in the preamble of Claim 1. The invention also relates to a method for assembling fabrics, which can be implemented using the abovementioned heat-sealing machine.

The present invention can be used in particular in connection with industrial processes for joining together textile articles of manufacture such as fabrics, non-woven fabrics, synthetic membranes and the like, for the purposes of producing items of clothing or other articles which can be produced using said articles of manufacture. "Assembly" is understood as meaning, in addition to stable joining together of two or more textile articles of manufacture, fixing together of two layers of an article of manufacture folded onto itself, as occurs for example when forming hems of items of clothing.

Background Art

The assembly of textile articles of manufacture by means of heat-sealing is at present performed with the aid of heat-sealing machines, for example of the type described in the document WO 2009/016669, in the name of the same Applicant, essentially comprising a conveying group provided with a conveying member in the form of a roller or motor-driven belt, co-operating with a conveying member in the form of an opposition counter-roller. The textile article of manufacture, which is formed by a first and a second textile layer to be joined together, is fed between the conveying member and the counter-roller acting in a zone for mutual joining of the layers.

In the mutual joining zone at least one of the layers has, on the surface facing the other layer, a thermoadhesive agent normally consisting of a heat-sealed strip. In the vicinity of the conveying group heating means operate on the article of manufacture in order to cause activation of the thermoadhesive agent. In particular, the heating means comprise essentially a heat convector designed to deliver a jet of hot air above the second layer, in the zone of entry of the article of manufacture between the conveying member and the counter-roller. The

consequent heating results in activation of the thermoadhesive agent such as to cause stable joining together of the fabrics, assisted by the pressing action resulting from the forced passage of the layers between the conveying member and the counter-roller.

The Applicant has noted, however, that with use of the heat-sealing machines designed according to the prior art it is often difficult to obtain optimum joining together of the layers which form the article of manufacture. It has in fact been noted that the quality of the joint obtained is dependent upon numerous parameters, such as the temperature and the flowrate of the air delivered by the heat conveyor, the speed of feeding of the articles through the conveying group and the pressure exerted by the counter-roller.

Optimum adjustment of these parameters requires a considerable amount of experience and constitutes a factor of critical importance with regard to the quality of the result obtained.

The Applicant has also noted that the heat supplied by the heat conveyor must necessarily pass through the second layer before reaching the thermoadhesive agent. Therefore, the adjustment of the abovementioned parameters is influenced significantly also by the physical properties of the articles of manufacture being worked. In particular, the second layer forms a barrier preventing transmission of the heat to the thermoadhesive agent and therefore requires relatively large amounts of heat in order to achieve activation of the thermoadhesive agent, negatively influencing the efficiency of the joining action and penalizing the thermal efficiency and the working speed.

In many cases, especially when delicate materials are used, it even becomes impossible to achieve a satisfactory joint without damaging the article owing to the large amount of heat required.

Disclosure of the Invention

In accordance with the present invention, the Applicant has realized that it is possible to overcome the limits and drawbacks of the prior art by eliminating the heat barrier consisting of the second layer in order to supply the heat to the thermoadhesive agent. It has thus been found that, by using a heat convector or other heat dispenser operating directly between the first and second layers in the zone of entry of the article of manufacture between the conveying member and the counter-roller, it is possible to achieve a substantial improvement in terms of working quality, productivity and simplification of the machine set-up operations, also when working materials with a low heat-resistance.

More particularly, these objects together with others, which will appear more clearly during the course of the present description, are substantially achieved by a heat-sealing machine for assembling fabrics, according to Claim 1 and/or the following Claims 2 to 12.

According to a further aspect, the invention also relates to a method for assembling fabrics, according to Claim 13 and/or one of the following Claims 15 to 17.

Brief Description of the Drawings

Further characteristic features and advantages will appear more clearly from the detailed description of a preferred, but not exclusive embodiment of a heat-sealing machine for assembling textile articles of manufacture, according to the present invention.

Said description will be provided hereinbelow with reference to the accompanying drawings which are provided solely by way of a non-limiting example and in which:

- Figure 1 shows a schematic perspective view of a heat-sealing machine according to the present invention;
- Figure 2 shows a detail, on a larger scale, of Figure 1;
- Figure 3 shows a detail, on a larger scale, of Figure 1, from a different angle;
- Figure 4 shows a detail, on a larger scale, of Figure 1, in a given working condition;
- Figure 5 shows a detail, on a larger scale, of Figure 1, sectioned along a vertical plane.

Detailed Description of the Preferred Embodiments of the Invention

With reference to Figure 1, 1 denotes in its entirety a heat-sealing machine for assembling textile articles of manufacture 2. The term "textile article of manufacture" is understood as meaning the assembly consisting of a first textile layer (referred to below as "first layer 2a") and a second textile layer (referred to below as "second layer 2b") which are joined together by means of thermoadhesive element. For the purposes of the present description "textile layer" is understood as meaning a semifinished article made of fabric, non-woven fabric, synthetic material in the form of a membrane or other semifinished articles used in the clothing sector or in other areas of the textile industry. The thermoadhesive element 3 may in turn consist of a heat-sealed strip. The strip may

have a substrate for example made of polyurethane which may be lined with a thermoadhesive component, for example also a polyurethane which has a melting temperature lower than that of the substrate, on one or both the surfaces for adhesion to the textile layers. During a first stage, a first surface of the strip is glued to the first layer, for example to the layer 2a. Then the second adhesive surface of the strip is exposed and joined to the second layer, for example the layer 2b, by means of the heat-sealing machine 1.

The heat-sealing machine 1 comprises a conveying group 4 comprising a first conveying member 4a co-operating with a second conveying member 4b for translation of the article of manufacture 2 being worked, in a predetermined feeding direction A (Fig. 1). The first and second layers 2a, 2b of the article of manufacture 2 being worked are interposed between the first and second conveying members 2a, 2b in a region of mutual junction of the layers themselves. At least one thermoadhesive element 3 is carried by at least one of the layers on the side facing the other layer in the region of mutual junction.

Preferably, the first and second conveying members 4a, 4b are arranged one above the other with the interposition of the article of manufacture 2 being worked sliding along a plane which is horizontal or inclined with respect to the horizontal.

For example, the conveying group 4 comprises a drive member 4a, co-operating with a counter-member 4b for translating the article of manufacture 2 being worked, in the predetermined feeding direction A. According to the preferred embodiment shown in Figure 1, the counter-member 4b is arranged above the drive member 4a. An alternative solution may also be envisaged where the counter-member 4b is arranged below the drive member 4a.

According to the preferred embodiment shown in Figure 1, the counter-member 4b is formed by means of an idle roller and the drive member 4a is formed by means of a belt wound around rollers at least one of which is motor-driven. Alternatively, the counter-member 4b may be formed by means of a belt wound around rollers. Alternatively also, the drive member 4a may be formed by means of a motor-driven roller.

Preferably the heat-sealing machine 1 comprises a guide 5 suitable for supporting the two layers of the article of manufacture 2 being worked with, interposed, the thermoadhesive element 3, so as to move towards the conveying group 4. The guide 5 is, for example, formed by means of a support surface which accompanies the article of manufacture 2 towards the conveying group 4. The first conveying member 4a is substantially incorporated in the guide 5 so as to operate

flush therewith, and the second conveying member 4b is arranged above the guide 5.

The heat-sealing machine 1 also comprises a heating unit 6 operating in the region of the conveying group 4. The heating unit 6 is designed to cause activation of the thermoadhesive element 3 carried by at least one of the layers 2a, 2b on the side facing the other layer in the region of mutual junction.

Advantageously the heating unit 6 comprises a heat dispenser 7 operating between the first and second layers 2a, 2b so as to direct a thermal carrier flux directly against the thermoadhesive element 3. In particular, the thermal carrier flow is directed towards the conveying group 4. In particular, the heat dispenser 7 is inserted partly between the first and second textile layers 2a, 2b of the article of manufacture 2 being worked. Advantageously the heat dispenser 7 operates between the first and second layers 2a, 2b in a position immediately upstream of the conveying group 4.

Preferably, the heat dispenser 7 comprises a delivery nozzle 8 operatively connected to a hot-air generating unit 9.

In particular the delivery nozzle 8 comprises a tubular element 10 having a longitudinal extension axis 11 substantially perpendicular to the feeding direction A of the article of manufacture 2 and having at least one outlet hole 12 oriented towards the conveying group 4 (Figure 5).

Preferably the delivery nozzle 8 is arranged laterally relative to the feeding direction A in the zone where the free end of the upper layer 2b is arranged. Advantageously the delivery nozzle 8 is arranged with its longitudinal axis 11 substantially horizontal or slightly inclined relative to the horizontal. In particular the delivery nozzle 8 is arranged with at least one end portion substantially parallel to the guide 5.

For example, the heat dispenser 7 may be transversely movable relative to the feeding direction A of the article of manufacture 2 being worked, preferably in a horizontal direction and/or substantially along its longitudinal axis. In particular, the dispenser 7 may be displaced, upon operation of an actuator 20 operating on a slide 21 carrying the dispenser itself, between an operating condition in which it is disposed upstream of the conveying group 4, with reference to the feeding direction A of the article of manufacture (as shown in the accompanying figures), and a rest condition in which it is laterally shifted relative to the conveying group 4 itself, so as not to hinder introduction of the article of manufacture 2 between the conveying members 4a, 4b during the initial stage of working. The term "laterally" is understood as meaning a position radially

displaced relative to the feeding direction A of the article of manufacture. In the case illustrated, the dispenser 7 in the rest condition is laterally positioned to the right relative to the working condition shown.

As shown for example in Figure 1, the heating unit 6 also comprises a second heat dispenser 13 designed to direct a second thermal carrier flux towards the conveying group 4, in particular towards the drive member 4a and the counter-member 4b, above the article of manufacture 2 being worked.

For example, the second heat dispenser 13 comprises a fixed conveyor 14 operating close to the conveying group 4, and a second delivery nozzle 15 operatively connected to a hot-air generating unit 16. The delivery nozzle 15 is preferably movable between a rest condition in which it is laterally moved away from the conveying group 4, to the right thereof with reference to Figure 1, and a working condition in which it is operatively coupled to the fixed conveyor 14, as per the accompanying figures.

According to the preferred embodiment shown in the figures, the fixed conveyor 14 operates close to the conveying member arranged above. More particularly, the fixed conveyor 14 operates close to the counter member 4b.

Preferably, the fixed conveyor 14 has an inlet opening 14a adapted to receive the hot-air flow from the second delivery nozzle 15 positioned in the working condition and an outlet opening 14b which is situated facing above the article of manufacture 2 being worked and directs the hot-air jet towards at least one of the conveying members, in particular towards the counter-member 4b (Figure 6).

In particular, the fixed conveyor 14 is partially wrapped around at least one of the conveying members, preferably the counter-member 4b, and comprises an open seat 17 for receiving a portion of the conveying member. The open seat 17 is placed in communication with the inlet opening 14a for the hot-air flow and defines the outlet opening 14b of the fixed conveyor 14. In other words, the fixed conveyor 14 has a C-shaped form which partially embraces the conveying member, in particular the counter-member 4b, receiving the hot-ait flow from the outside via the inlet opening 14a and distributing it over the outer surface of the conveying member (Figure 6).

Preferably, at least one of the first and second conveying members 4a, 4b comprises an outer surface 18 suitable for acting against the article of manufacture 2 being worked and made of thermally conductive, preferably metallic, material. For example, the outer surface is made of copper.

Advantageously the conveying member having the abovementioned outer

surface made of a thermally conductive, preferably metallic, material is the idly mounted counter-member 4b. In particular, the conveying member having the abovementioned outer surface made of a thermally conductive, preferably metallic, material is the member arranged above.

In the case where the fixed conveyor 14 is envisaged, it is preferable for this fixed conveyor 14 to operate close to the conveying member having the abovementioned outer surface 18 made of a thermally conductive, preferably metallic, material. As shown in Figure 1, the fixed conveyor 14 operates close to the counter-member 4b having the abovementioned outer surface 4b made of a thermally conductive material.

Alternatively or in addition the outer surface made of thermally conductive material may be provided on the drive member 4a. In this case also preferably this thermally conductive material is a metallic material. Even more preferably the drive member 4a acts against the article of manufacture 2 being worked, by means of an outer surface made of copper.

The heat-sealing machine 1 may also comprise control means which can be selectively activated for performing the movement, preferably the translation, of the heat dispenser 7 towards the respective operating condition, simultaneously or with a predetermined advance relative to operation of the conveying group 4. In other words, the control means induce heating of the article of manufacture by means of the heat dispenser 7 simultaneously or with a predetermined advance relative to operation of the conveying group 4.

Preferably it is envisaged providing control means which can be selectively activated for performing the movement of the second heat dispenser 13 towards the respective operating condition with a predetermined advance, preferably of between 1 and 5 seconds, relative to operation of the conveying group 4. In other words, the control means induce heating of the article of manufacture by means of the heat dispenser 13 with a predetermined advance relative to operation of the conveying group 4.

For example, a standard control unit forms the abovementioned control means which controls the movement both of the heat dispenser 7 and of the second heat dispenser 13, for example by means of operation of a pedal by the user.

With reference to the embodiment shown above, the operating principle of the heat-sealing machine is now described.

During a first stage. not further described, a first surface of the thermoadhesive element 3 is glued to the first textile layer 2a, for example the

layer arranged underneath with reference to the figures. Then the second adhesive layer of the thermoadhesive element 3 is exposed and the second layer 2b (in the figure for example the upper layer) is partially superimposed on the first layer in the region of the thermoadhesive element 3.

The end portion of the article of manufacture 2 being worked is inserted between the two conveying members 4a, 4b, while an operator accompanies the two layers 2a, 2b along the guide 5 and operates the heat-sealing machine.

Upon operation of the heat-sealing machine, preferably the control means move the second heat dispenser 13 towards the respective operating condition with a predetermined advance, preferably of between 1 and 5 seconds, relative to operation of the conveying group 4. Then the heat dispenser 7 is moved and the conveying group 4 is operated.

The movement of the second heat dispenser 13 is preferably performed by means of angular oscillation about a fixed point, while the movement of the heat dispenser 7 is performed preferably by means of translation along a preferably horizontal plane. Variations of these forms of movement are, however, possible.

It should be noted that the heat dispensers are preferably always in operation in order to prevent activation delays, so that the displacement towards the article of manufacture coincides with activation of heating of the article of manufacture itself.

The hot-air flow of the second heat dispenser 13 surrounds the counter-member 4b and heats the outer surface 18 which improves the adhesion of the two layers 2a, 2b in the region of the front or end portion of the article of manufacture itself.

Then the second heat dispenser 13 continues to heat the counter-member 4b, but the main heating action for causing adhesion of the two layers 2a, 2b is performed by the heat dispenser 7 directly inserted between the two layers 2a, 2b of the article of manufacture. In this way the heat-sealing machine may be set up independently of the type of layers 2a, 2b being worked since the action of the heat flow does not pass through the upper layer but acts directly on the thermoadhesive element 3.

The conveying group 4 conveys the article of manufacture 2 being worked and exerts a simultaneous pressure which favours adhesion by the thermoadhesive element 3 heated immediately upstream of the conveying group 4 itself.

According to a further aspect, the present invention relates to a method for assembling textile articles, wherein a first and a second layer 2a, 2b of the article of manufacture 2 which overlap each other at least in a region of mutual junction

are subjected to a heating action in the junction region for determining activation of a thermoadhesive element 3 provided on a surface of at least one of the layers 2a, 2b facing the other layer, for determining stable coupling of the layers 2a, 2b by the heat-activated thermoadhesive element 3.

The heating action is performed preferably in combination with a pressing action at least in the junction region.

In particular, the heating action is carried out by conveying thermal energy between the first and second layers 2a, 2b by means of at least one heat dispenser 13 interposed between the first and second layers 2a, 2b upstream of the conveying group 4 operating in the region of mutual junction so as to cause feeding of the layers 2a, 2b through a work region.

Preferably, the heating action is further carried out by conveying thermal energy with a second thermal carrier flux towards the conveying group 4. Preferably, the heating action is further carried out by conveying thermal energy with a second thermal carrier flux towards at least one of the conveying members and transferring it to the thermoadhesive element 3 by means of conduction using an outer surface, made of thermally conductive material, of the conveying member itself.

In particular, the second thermal carrier flux is conveyed towards the conveying group 4 with a predetermined advance, preferably of between 1 and 5 relative to operation of the conveying group 4.

Preferably, the thermal energy is conveyed between the first and second layers 2a, 2b by means of at least one heat dispenser 13 interposed between the first and second layers 2a, 2b upstream of the conveying group 4 simultaneously or with a predetermined advance relative to operation of the conveying group 4 itself.

As already stated previously, the original provision of a heat dispenser 13 operating between the first and second layers 2a, 2b so as to direct a thermal carrier flux directly towards the thermoadhesive element 3 allows an improvement in the heating efficiency and elimination of operating variables due to the type of layer used. This aspect is particularly advantageous in the case of a delivery nozzle 15 operatively connected to a hot-air generating unit 16 which forms a system which is simple, but in particular subject to the variables in question.

By designing the delivery nozzle 15 in the form of a tubular element having a longitudinal extension axis substantially perpendicular to a feeding direction of the article of manufacture 2 being worked and having at least one outlet hole oriented towards the conveying group 4, a solid, simple and effective structure

able to direct the thermal flux directly onto the thermoadhesive element 3 between the two layers 2a, 2b, without introducing excessive complications, is obtained.

The provision of a movable heat dispenser 13 results in an improvement in the operating efficiency, since the heat dispenser 13 is kept always operational and heating of the article of manufacture is activated depending on its position.

The second heat dispenser 13 designed to direct a second thermal carrier flux towards the conveying group 2b improves and ensures generally more uniform adhesion of the two layers 2a, 2b, in particular along the end edge of the article of manufacture, not directly acted on by the flux of the heat dispenser 13 arranged directly between the two layers 2a, 2b.

The fixed conveyor 14 operating close to the conveying group 4 ensures optimized diffusion of the thermal flux over the conveying member and, with the aid of the continuous delivery, avoids delays during activation. Moreover, owing to the presence of a fixed conveyor 14, it is possible to design specifically a form of the fixed conveyor itself 14 suitable for distributing in an optimum manner the thermal flux over the conveying member.

This aspect is particularly advantageous in the case where further heating of the article of manufacture is performed by means of conduction, for example with the provision of an outer conducting surface of the conveying member. In general the provision of an outer conducting surface of the conveying member in any case offers advantages associated with the fact of being able to apply a pressure and perform corresponding heating in the zone which passes through the conveying member 4. In this way a uniform adhesion is obtained, without damaging the fabric as a result of excessive heating.

The abovementioned advantages also exist in the method for assembling textile articles as described above.

The present invention may be realized in the form of numerous variants within the competence of the person skilled in the art, some of which have been described above.

Claims

1. A heat-sealing machine for assembling textile articles of manufacture, comprising:

– a conveying group comprising a first conveying member co-operating with a second conveying member for translation of an article of manufacture being worked in a predetermined feeding direction, said article of manufacture comprising at least one first and one second layer adapted to be interposed between said first and second conveying members in a region of mutual junction of the layers themselves;

– a heating unit operating at the conveying group for determining activation of at least one thermoadhesive element carried by at least one of the layers on a side thereof facing the other layer in the region of mutual junction,

characterised in that said heating unit comprises a heat dispenser adapted to operate between the first and second layers to direct a thermal carrier flux against the thermoadhesive element.

2. A machine as claimed in claim 1, wherein said heat dispenser comprises a delivery nozzle operatively connected to a hot-air generating unit, said delivery nozzle preferably comprising a tubular element having a longitudinal extension axis substantially perpendicular to a feeding direction of the article of manufacture being worked and provided with at least one outlet hole oriented towards the conveying group.

3. A machine as claimed in one or more of the preceding claims, wherein said heat dispenser is transversely movable relative to the feeding direction of the article of manufacture being worked, preferably in a horizontal direction, between an operating condition at which it is disposed upstream of the conveying group (4), with reference to the feeding direction (A) of the article of manufacture and a rest condition at which it is laterally shifted relative to the conveying group itself.

4. A machine as claimed in one or more of the preceding claims, wherein said heating unit further comprises a second heat dispenser designed to direct a second thermal carrier flux towards said conveying group.

5. A machine as claimed in the preceding claim, wherein said second heat dispenser comprises a fixed conveyor operating close to the conveying group and

a second delivery nozzle operatively connected to a hot-air generating unit and movable between a rest condition at which it is laterally moved away from said conveying unit and a work condition at which it is operatively coupled to the fixed conveyor.

6. A machine as claimed in the preceding claim, wherein said fixed conveyor has an inlet opening adapted to receive the hot-air flow from said second delivery nozzle in a work condition and an outlet opening directing the hot-air jet towards at least one of said conveying members.

7. A machine as claimed in claim 5 or 6, wherein said fixed conveyor is partly wrapped around at least one of said conveying members and comprises an open seat for receiving a portion of said conveying member, wherein said open seat is put in communication with an inlet opening for the hot-air flow and wherein said open seat defines an outlet opening of the fixed conveyor.

8. A machine as claimed in one or more of the preceding claims, wherein at least one of said first and second conveying members comprises an outer surface of a thermally conductive material, preferably a metal material, copper for example, suitable to act against the article of manufacture being worked.

9. A machine as claimed in one of claims 5 to 7 and in claim 8, wherein said fixed conveyor acts close to the conveying member having said outer surface made of a thermally conductive, preferably metallic, material.

10. A machine as claimed in claim 9, wherein said conveying member having said outer surface of a thermally conductive, preferably metallic, material is an idly-mounted counter-member.

11. A machine as claimed in claim 3, further comprising drive means to be selectively activated for driving the movement, preferably translation, of the heat dispenser to the respective operating condition, simultaneously with or with a pre-established advance relative to operation of the conveying group.

12. A machine as claimed in claim 5, further comprising drive means to be selectively activated for driving the movement of the second heat dispenser to the

respective operating condition with a predetermined advance, preferably included between 1 and 5 seconds, relative to operation of the conveying group.

13. A method of assembling textile articles of manufacture, wherein a first and a second layer of the article of manufacture that overlap each other at least in a region of mutual junction are submitted to a heating action in said junction region for determining activation of the thermoadhesive element provided on a surface of at least one of the layers facing the other layer, for determining steady coupling of the layers by the heat-activated thermoadhesive element,
characterised in that said heating action is carried out by conveying thermal energy between the first and second layers by at least one heat dispenser interposed between the first and second layers upstream of a conveying group operating in the region of mutual junction to cause feeding of the layers through a work region.

14. A method of assembling textile articles of manufacture as claimed in claim 13, wherein said heating action is further carried out by conveying thermal energy with a second thermal carrier flux towards said conveying group.

15. A method of assembling textile articles of manufacture as claimed in claim 14, wherein said heating action is further carried out by conveying thermal energy with a second thermal carrier flux towards at least one of the conveying members and transferring it to the thermoadhesive element by conduction using an outer surface of thermally conductive material of the conveying member.

16. A method of assembling textile articles of manufacture as claimed in claim 14 or 15, wherein said second thermal carrier flux is conveyed towards said conveying group with a predetermined advance, preferably included between 1 and 5 seconds, relative to operation of the conveying group.

17. A method of assembling textile articles of manufacture as claimed in one of the preceding claims, wherein said thermal energy is conveyed between the first and second layers by at least one heat dispenser interposed between the first and second layers upstream of the conveying group simultaneously with or with a pre-established advance relative to operation of the conveying group.

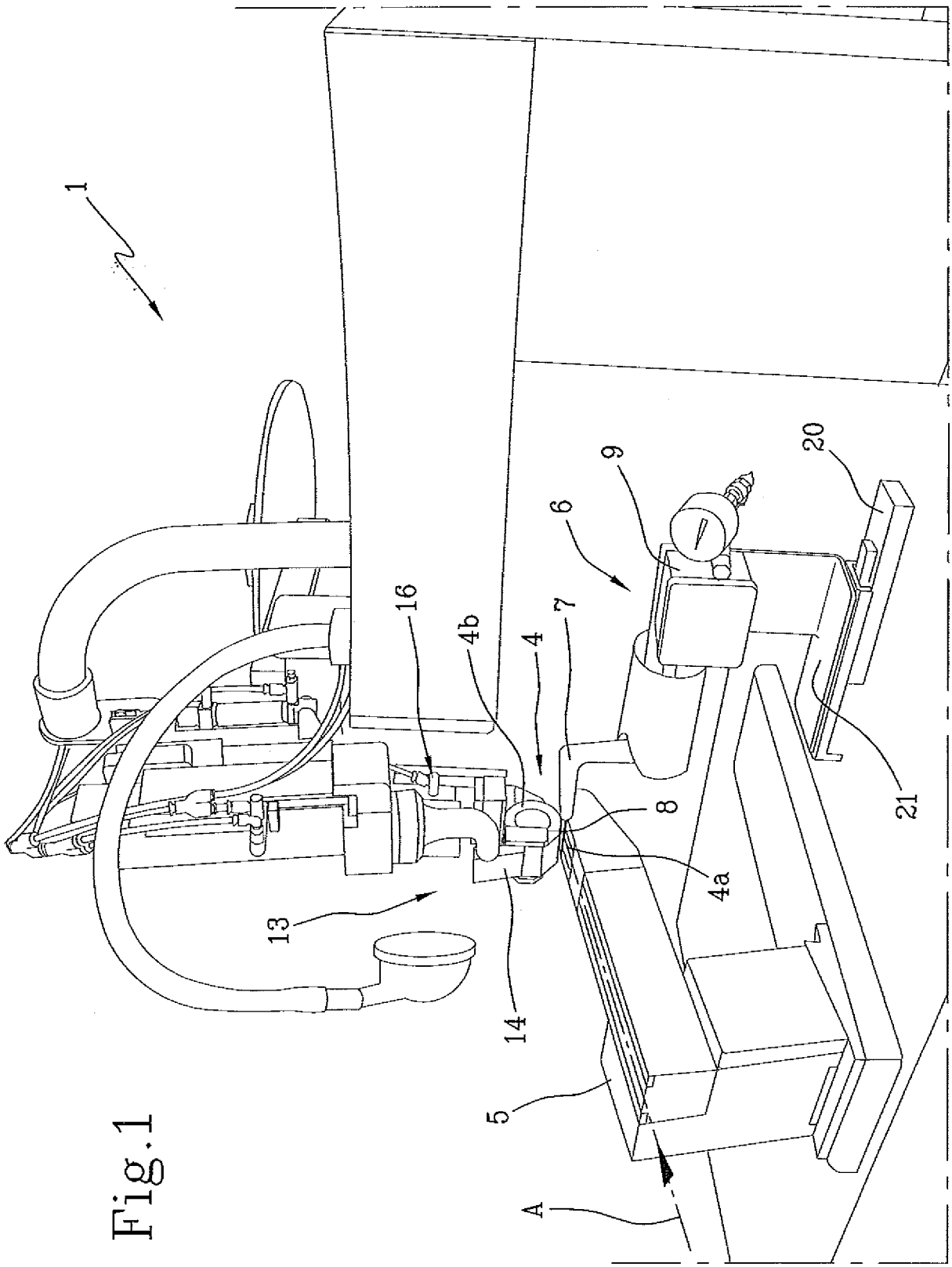


Fig.1

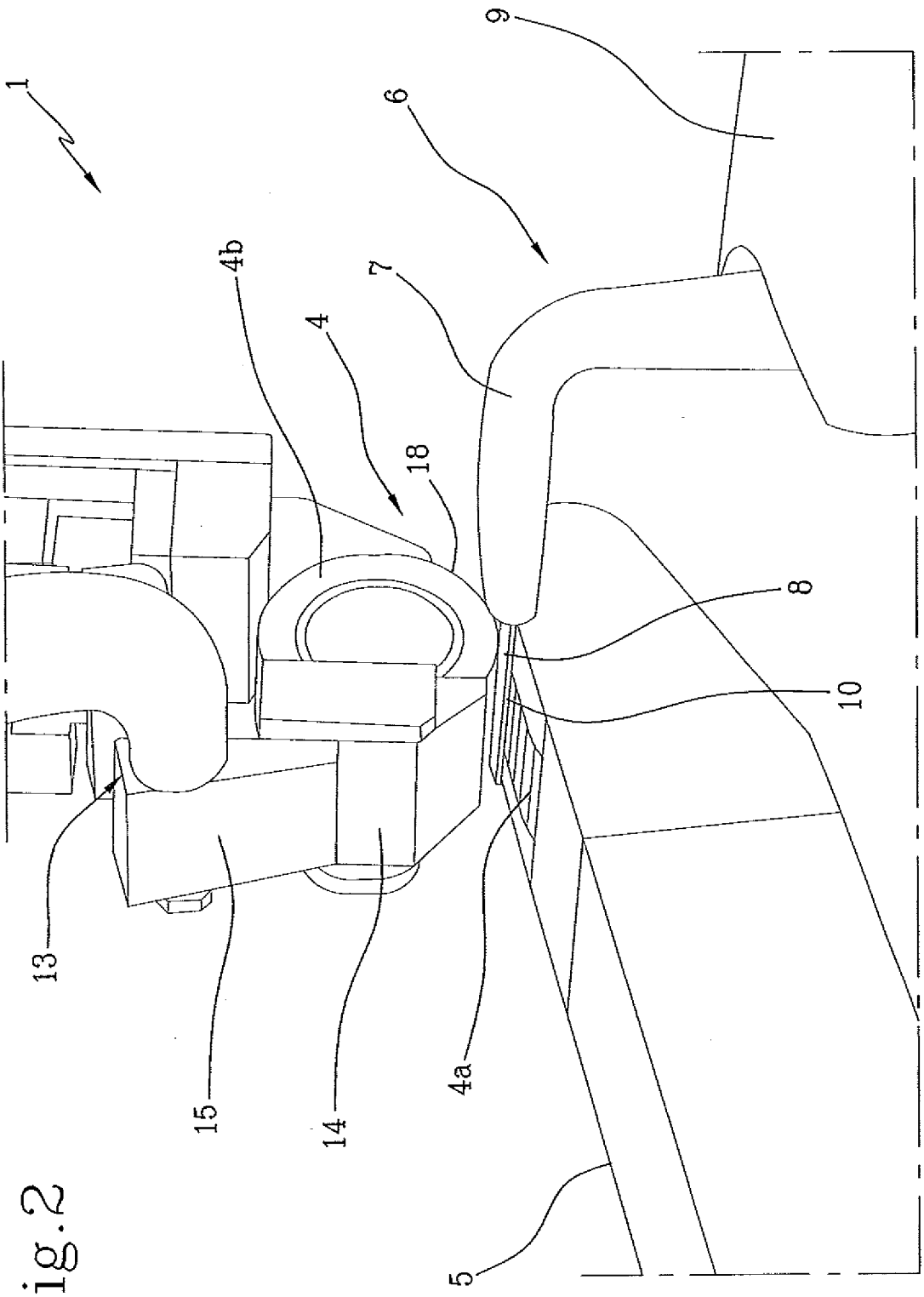


Fig.2

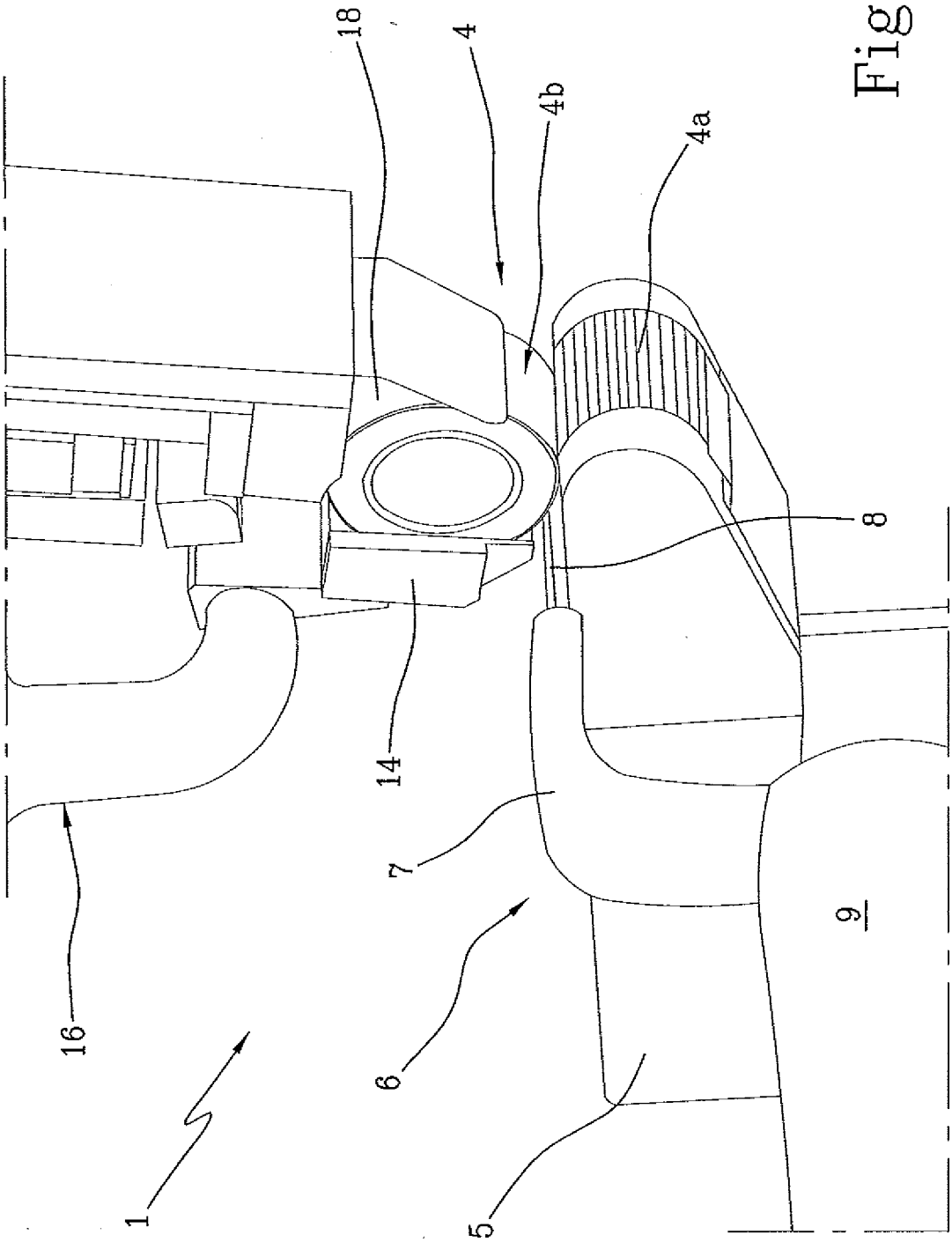


Fig.3

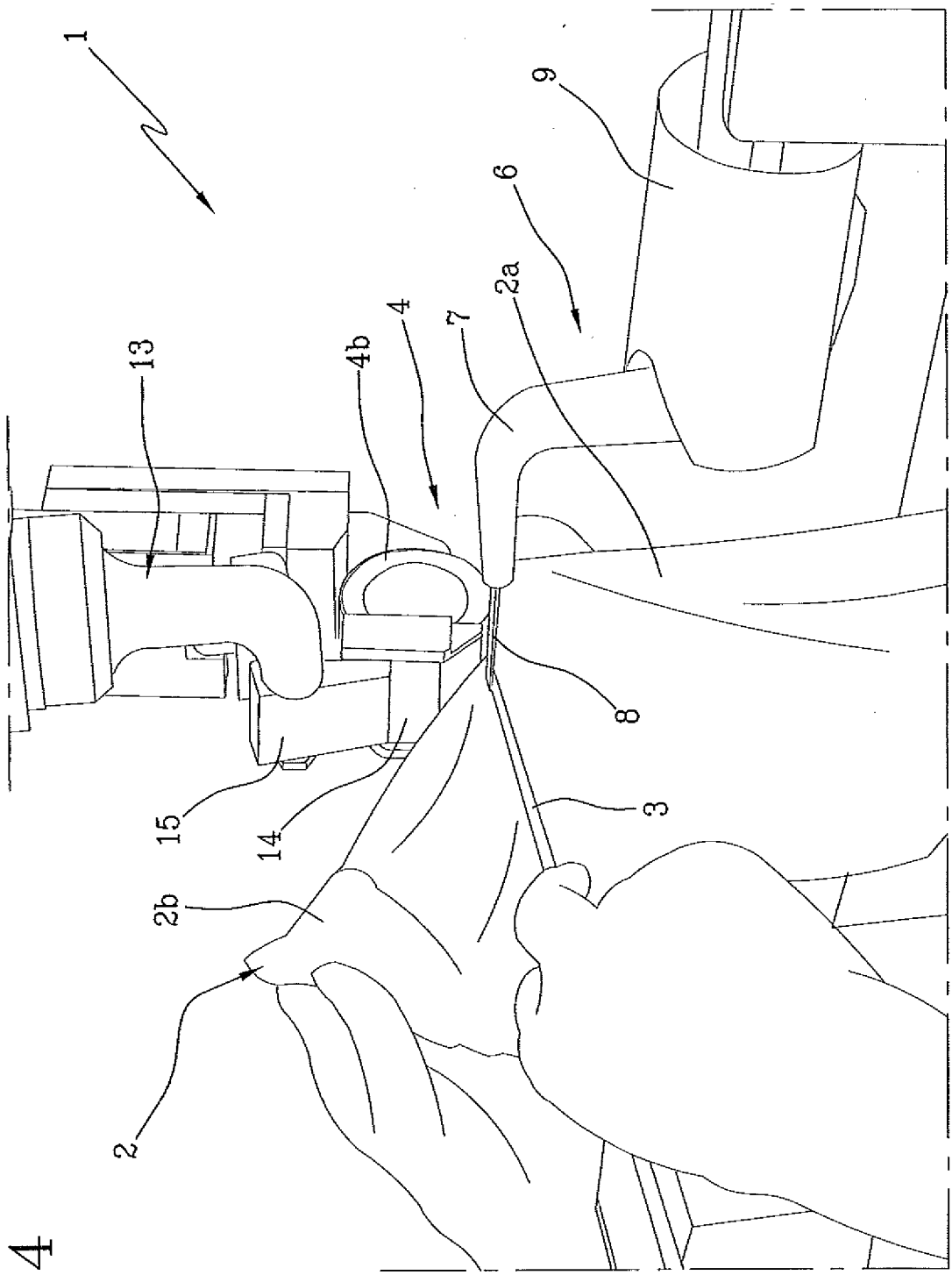


Fig.4

Fig.5

