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(54) **Method and device for decatizing a fabric**

(57) Method and device (10) for decatizing fabrics (11), wherein a fabric (11) is made to transit inside a sealed chamber (13) filled with steam under pressure; the sealed chamber (13) also comprises at least an inlet (14) and at least an outlet (15) associated with respective sealing means (16). From the inlet (14) to the outlet (15) of the sealed chamber (13) the fabric (11) is accom-

panied in a sandwich between at least two continuous sub-pieces (20,21) made of material having a high quality surface. The sub-pieces (20,21) unwind from respective unwinding rollers (22,23) arranged on one side of the sealed chamber (13) and wind onto respective winding rollers (122,123) arranged on the opposite side of the sealed chamber (13).

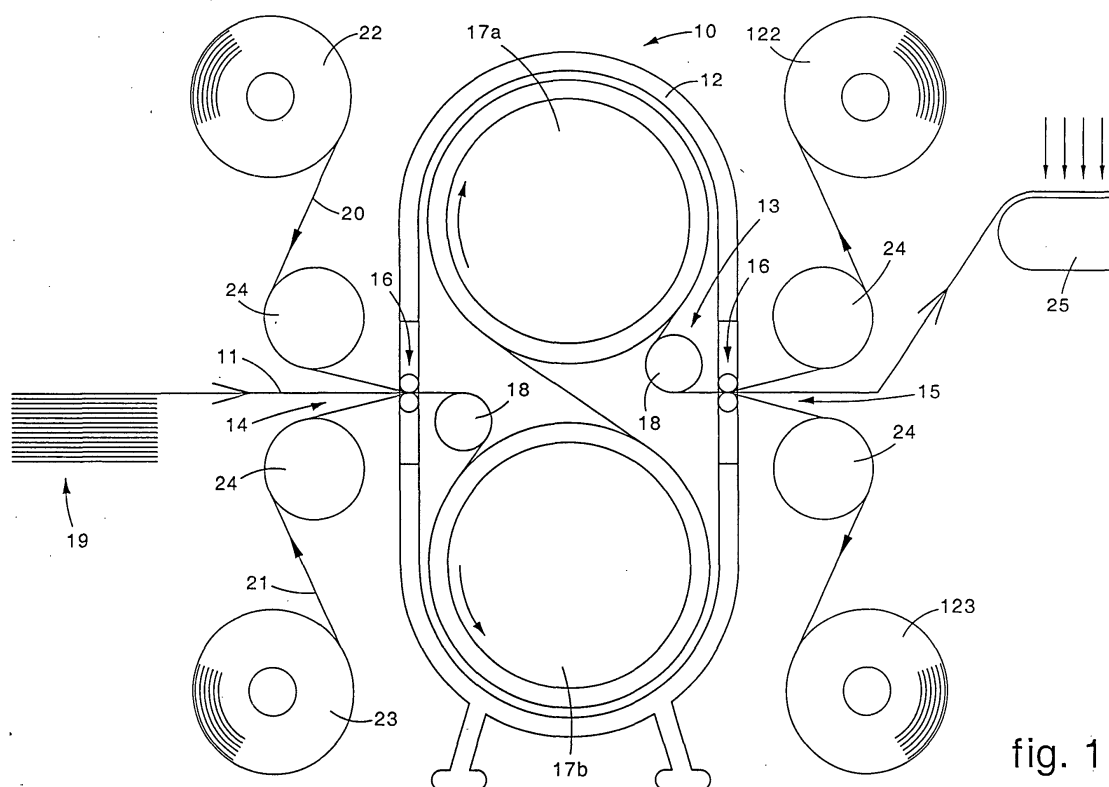


fig. 1

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Description

FIELD OF THE INVENTION

[0001] The invention concerns a method and device for the décatissage of a fabric.

[0002] To be more exact, it concerns a method and a device wherein the fabric is subjected to a semi-continuous treatment under pressure inside a steam chamber, said fabric being transported in a sandwich between two sub-pieces made of material suitable to confer high quality, surface uniformity and evenness on the feel of the fabric.

BACKGROUND OF THE INVENTION

[0003] In the field of textile finishing processes before making up, the state of the art teaches to subject the fabric to a steam treatment, known as décatissage. The purpose is to give fullness and softness to the touch, and to stabilize the feel and size of the fabric.

[0004] To be more exact, décatissage under pressure provides to subject a fabric, kept mechanically constrained, to a steam treatment under pressure and at a temperature of around 102÷130 °C, using suitable sub-pieces the function of which is to produce the desired effects of fixing, finishing and feel on the fabric. The fabric emerging from the décatissage treatments has a regular surface, with sizes and shine which remain stable with respect to ironing and drops of water.

[0005] The devices used to perform décatissage substantially divide into two categories: continuous and discontinuous devices.

[0006] In the first category there are devices comprising at least a pressurized steam chamber, delimited at inlet and outlet by sealing devices, inside which a fabric is made to pass. The fabric is compressed between two sub-pieces in a closed ring, normally about 15÷20 metres in length, which are permeable to steam. Examples of such devices can be seen in WO-A-94/10368, EP-B-293.028, EP-A-1.010.797 and FR-A-2.154.244.

[0007] In the present state of the art, continuous décatissage devices are not very widespread for a plurality of reasons. First of all, the plants are generally expensive, both in construction and in functioning.

[0008] Secondly, to avoid having a cross stitch, the sub-pieces in the closed ring consist of non-fabrics with sewing yarns made of polyester, nomex® or similar materials; these materials do not allow to obtain effects on the feel comparable to those obtainable using sub-pieces of greater value, for example made of cotton or synthetic/cotton satin or of thick flannel (molleton) in the event that it is desired to obtain a typical appearance and a soft and raised feel.

[0009] The latter fabrics, in fact, given their limited thickness and extreme regularity of their surface, cannot be stitched to form a closed ring since the imprint of such stitches would be transferred onto the fabric, with ex-

tremely negative aesthetic effects.

[0010] Furthermore, the surface of the sub-pieces made of polyester or nomex® is not regular and has a thickness of not less than about 5 mm, so that it is extremely difficult to guarantee to the fabric a homogeneous surface treatment. Due to this relatively great thickness, there are sealing problems at inlet to and outlet from the machine, and hence safety problems for the workers and the environment.

[0011] Another shortcoming is that the sub-pieces are subject to obstructions due to the dust and the chemical products present in the fabric, so that their permeability to the passage of the steam is rapidly reduced, compromising the efficiency of the treatment. Moreover, the duration of the closed-ring sub-pieces in a condition of efficiency is limited due to the continuous and repeated passages inside the pressurized chamber.

[0012] For these reasons, discontinuous décatissage devices in autoclave are more common; these comprise at least:

- a rolling station and an unrolling station, in which the fabric to be treated (treated) and at least one sub-piece are respectively wound onto (and unwound from) a perforated metal cylinder;
- a closed pressurized chamber, wherein the fabric wound with the sub-piece on the metal cylinder is subjected to a treatment with saturated steam at a temperature which can vary between about 105 and 130 °C, for a time which can vary from about 1 to about 5 minutes, and then removed to be sent for unrolling.

[0013] In this type of discontinuous treatments, it is possible to use sub-pieces with particular quality and value, for example cotton, cotton/synthetic or synthetic satin, thick flannel or similar, which allow to achieve optimum finishing effects thanks to their smooth and regular surface, reduced thickness, optimum permeability to steam and good mechanical resistance.

[0014] However, such discontinuous autoclave devices have the considerable disadvantage that the fabric is not treated homogeneously, since the flow of steam passing through the layers of fabric varies its physical conditions due to losses of load distributed in an irregular fashion during the transition step between the fibers.

[0015] Moreover, there is a physical irregularity due to the irregular compression to which the fibers are subjected between the periphery and the center of the roller, which generates non-homogeneous tensions in the wound fabric.

[0016] To overcome these problems of irregularity, after the steam treatment inside the autoclave a further décatissage is provided, normally at atmospheric pressure, the purpose of which is to make the feel and surface of the fabric uniform. Moreover, before the fabric passes into the autoclave, it is preferable to make a con-

tinuous calendering operation on it, which serves to make uniform the surface and thickness of the fabric to be treated, thus reducing the negative effects of the irregularities implicit in autoclave treatments.

[0017] However, such treatments, upstream and downstream, entail burdensome costs and additional times, greater spaces for the machine and a larger work force, and considerably reduce the efficiency of the treatment.

[0018] The present Applicant has devised and embodied this invention to overcome the shortcomings described above, and to obtain further advantages as will be described hereafter.

SUMMARY OF THE INVENTION

[0019] The invention is set forth and characterized in the main claims, while the dependent claims describe other innovative characteristics of the invention.

[0020] The purpose of the invention is to achieve a method and device for the semi-continuous décatissage under pressure of any type of fabric, wherein it is possible to use, as supporting sub-pieces, materials suitable to give high characteristics of surface quality and regularity, such as in particular satin or thick flannel made of cotton, cotton/synthetic or synthetic, or other similar materials, without the disadvantages described above deriving from discontinuous treatments.

[0021] To be more exact, the invention allows to obtain, with a single pass inside a pressurized steam chamber, a substantially finished fabric, with a uniform and perfectly treated surface, possibly with a different quality on the visible and non-visible face.

[0022] Satins are very beaten weft/chain cotton fabrics, cotton/synthetic mixes (polyester, nomex®, or nylon®) or synthetics characterized in that they have a perfectly regular surface, an extremely limited thickness, in the order of 0.1÷0.7 mm, great permeability to steam, in the order of 30÷100 mm per second, and good mechanical resistance.

[0023] Thick flannels have a slightly greater thickness, in the order of about 2÷2.5 mm and they too have great permeability to steam and good mechanical resistance.

[0024] In accordance with these purposes, a device according to the invention comprises at least a sealed chamber, equipped with at least an inlet and an outlet, and defining an inner volume which is filled with steam at a pressure which can be regulated from about 1.1 bar to about 7 bar, with a temperature of between about 102 °C and about 160 °C; inside the sealed chamber there is at least a drawing cylinder, heated and/or holed, advantageously two, on the surface of which the fabric to be treated is wound.

[0025] The fabric is made to pass, substantially continuously and at an adjustable speed, from inlet to outlet of the sealed chamber; the inlet and outlet are associated with sealing systems of any type whatsoever.

[0026] According to one characteristic of the invention, the fabric to be treated is accompanied in a sandwich inside said chamber, between two continuous sub-pieces made of a material with a high quality surface, such as satin, thick flannel or similar materials, which unwind from respective rollers arranged on one side of the sealed chamber and wind onto respective rollers arranged on the opposite side of said sealed chamber.

[0027] The two sub-pieces, continuous and without cross stitches, advantageously have a minimum length in the order of 100÷200 metres, advantageously more than 500 metres, but they can even reach a length of 4000÷5000 metres.

[0028] When the sub-pieces have travelled completely from one side of the sealed chamber to the other, the feed of the fabric is interrupted and a new fabric can be introduced from the opposite side and accompanied between the two sub-pieces which are unwound in the opposite direction to that of the first treatment cycle.

[0029] The invention thus described allows to obtain a plurality of advantages.

[0030] First of all, although it uses sub-pieces made of material with high and extremely high surface quality, such as cotton satin or similar, it allows to guarantee a continuous process. This also allows to do without pre- and/or posttreatment processes, which are required in the case of discontinuous treatments with the fabric stationary in a closed autoclave.

[0031] Moreover, it allows to differentiate the quality of the visible face with respect to the non-visible face of the fabric, using two sub-pieces of a different material and/or type, for example a satin of pure cotton for the visible face and a cotton/synthetic satin mix, or more economical quality, or a thick flannel, for the non-visible face.

[0032] Since the materials used for the sub-pieces have a very limited thickness, maximum 2-2.5 millimetres for the thick flannels, but as little as 0.1÷0.7 for the satins, there are no safety problems regarding the steam seal at inlet to and outlet from the chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] These and other characteristics of the invention will become clear from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- Fig. 1 is a schematic view of a décatissage device according to the invention;
- Fig. 2 shows the device in Fig. 1 in a second condition of use;
- Fig. 3 shows a variant of a detail of the device in Figs. 1 and 2.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

[0034] In the attached Figures, a device for the décatissage of a fabric 11 is denoted generally by the reference number 10 and comprises an autoclave 12, advantageously insulated, the inner volume of which defines a sealed chamber 13 filled with steam at a pressure of between 1.1 and 7 bar.

[0035] The autoclave 12 has an inlet 14 and an outlet 15 associated with respective sealing means 16 which, in this case, consist of inflatable rubber devices, such as air chambers or bellows. It is clear that, instead of the inflatable devices shown here, any suitable sealing means having the same function can be used in the device 10 according to the invention.

[0036] Inside the sealed chamber 13 there are two driven drawing cylinders, upper 17a and lower 17b, advantageously holed and/or heated which, in co-operation with guide cylinders 18 associated respectively with the inlet 14 and the outlet 15, define the path of the fabric 11 inside the autoclave 12.

[0037] The fabric 11 to be treated is fed from an appropriate roll 19, or from continuous pieces, and is accompanied in a sandwich, substantially from the inlet 14 of the autoclave 12, between two sub-pieces of satin, or other material with identical or comparable characteristics, respectively 20 and 21.

[0038] The two sub-pieces 20 and 21 are unwound from respective unwinding feed rollers 22 and 23, arranged on one side of the autoclave 12; after having accompanied the fabric 11 for the whole path inside the autoclave 12, the sub-pieces 20 and 21 wind onto respective winding rollers 122 and 123 arranged on the opposite side of the autoclave 12.

[0039] The unwinding rollers 22, 23 and the winding rollers 122, 123 cooperate with respective movable cylinders 24, which allow to regulate the tension of the respective sub-pieces 20 and 21.

[0040] Between the sub-pieces 20 and 21 and the respective sealing devices 16 it is possible to put a thin sheet of glass fiber, or similar material, to make the contact surface smoother and more regular.

[0041] The fabric 11 emerging from the treatment in the autoclave 12 is sent, in the case shown here, to a cooling treatment made by a suitable cooling unit 25.

[0042] When the sub-pieces 20 and 21 have been completely unrolled from the rollers 22 and 23 (in this case with their terminal end anchored to said rollers 22 and 23) and have completely wound onto the rollers 122 and 123, a new fabric 111 (Fig. 2) is introduced into the autoclave 12 in the opposite direction to that of the fabric 11, the direction of rotation of the rollers 122, 123 and 22 and 23 is inverted, and a new décatissage cycle is started, identical to the previous one but in the opposite direction of feed.

[0043] A second cooling unit 25 is provided arranged upstream of the inlet 14 to the autoclave 12, which is

activated during the cycle with the inverted direction.

[0044] According to a first variant, when the sub-pieces 20 and 21 have completely unwound from the rollers 22 and 23 and have wound onto the rollers 122 and 123, the treatment of the fabric 11 is interrupted and the sub-pieces 20 and 21 are re-wound at high speed, making the rollers 22, 23, 122 and 123 rotate in the opposite direction. To encourage this re-winding, which can be performed even at a speed of 400÷500 m/min, with respect to a normal speed of unwinding, during the treatment, of 15÷20 m/min, the sealing devices 16 are advantageously opened and the pressure of the steam is released.

[0045] When the sub-pieces 20 and 21 have finished re-winding, the décatissage cycle can be started again.

[0046] According to another variant, the rollers 122 and 123 on which the respective sub-pieces 20 and 21 are wound are removed and transferred onto the inlet side 14 of the machine. During the transfer of the sub-pieces 20 and 21, the machine 10 will continue to have drawn in a piece of any fabric having a length of 15÷20 metres, to which the sub-pieces 20 and 21 will be joined in order to be introduced into the machine 10 again. This piece of any fabric can consist of synthetic fabric, poorer quality fabrics, sub-pieces of a conventional type used for drawing into textile machines of various types such as décatizers, calenders, cutting machines or raising machines.

[0047] When this operation is terminated, the cycle can start again in the same direction as the previous one.

[0048] According to another variant which is not shown here, the sub-pieces 20 and 21 are completely unrolled from the rollers 22 and 23 and wound onto the rollers 122 and 123; from this position, the group of rollers 22, 23, 122 and 123 is made to rotate around the autoclave 12 and the pairs of rollers exchange their position, thus allowing to introduce the fabric 11 always from the same side and also to use one cooling unit 25 only.

[0049] In this case too, when the sub-pieces 20 and 21 are changed, the machine remains with a segment of any fabric whatever drawn in, to which the sub-pieces 20 and 21 will be joined in order to be introduced into the machine.

[0050] In this way, we obtain a décatissage treatment substantially continuous for the entire length of the sub-pieces 20 and 21, which can reach as much as 4-5,000 meters. Moreover, since the sub-pieces 20 and 21 remain inside the autoclave 12 for a short time, they do not suffer so much wear and therefore last longer in time.

[0051] The variant shown in Fig. 3 shows an alternative system wherein at inlet to and/or at outlet from the pressure chamber 13 there is a transit chamber 27, delimited by respective sealing devices 16 at inlet and outlet, wherein a strong depression is created, with a residual pressure in the order of 0.1÷0.5 bar.

[0052] The function of this transit chamber 27 under depression, located at inlet to the sealed chamber 13, is mainly to remove the air almost completely from the fabric 11 and the sub-pieces 20 and 21; this allows to drastically reduce the time in which the fabric 11 is im-

pregnated with steam inside the chamber 13 and to reduce the risks of damaging the fabric due to the oxygen in the air.

[0053] When the transit chamber 27 is present at outlet from the chamber 13, its function is to eliminate the steam fumes from the sub-pieces 20 and 21 and from the fabric 11, encouraging and accelerating cooling.

[0054] The fabrics 11 introduced into the autoclave 12 can be impregnated in advance with chemical products such as bisulphite salts, ammonium salts, etc.

[0055] The fabrics can also be, without any limitation, wool, wool mix, polyester, polyester mix, polyamide, polyamide mix, lycra®, lycra® mix, silk, silk mix, cotton, cotton mix, viscose, viscose mix, etc., or weft chain fabrics or knitwear fabrics.

[0056] The fabrics 11 can also arrive in the autoclave 12 substantially dry, with a percentage of humidity in the order of 15÷17%, particularly for wool, or wet, with a percentage of humidity which can reach up to 80% of the weight of the fabric.

[0057] Modifications and/or additions may be made to the invention as described heretofore, without departing from the spirit and scope of the invention.

Claims

1. Method for the décatissage of fabrics (11), wherein a fabric (11) is made to transit inside a sealed chamber (13) filled with steam under pressure and comprising at least an inlet (14) and at least an outlet (15) associated with respective sealing means (16), **characterized in that** from said inlet (14) to said outlet (15) said fabric (11) is accompanied in a sandwich inside said sealed chamber (13) between at least two continuous sub-pieces (20, 21) of material having a high quality surface, said sub-pieces (20, 21) unwinding from respective unwinding rollers (22, 23) arranged on one side of said sealed chamber (13) and winding onto respective winding rollers (122, 123) arranged on the opposite side of said sealed chamber (13).
2. Method as in claim 1, **characterized in that** said high surface quality material is cotton, cotton/synthetic or synthetic satin.
3. Method as in claim 1, **characterized in that** said high surface quality material is cotton, cotton/synthetic or synthetic thick flannel.
4. Method as in claim 1, **characterized in that** said continuous sub-pieces (20, 21) have a length of at

least 100 metres.

5. Method as in claim 4, **characterized in that** said continuous sub-pieces (20, 21) have a length of between 500 and about 5000 metres.
6. Method as in claim 1, **characterized in that** it provides that the sub-piece (20) associated with one face of the fabric (11) is of a different material and/or quality from the sub-piece (21) associated with the opposite face of the fabric 11.
7. Method as in claim 1, **characterized in that** when the two continuous sub-pieces (20, 21) have completely travelled from one side to the other of said sealed chamber (13), the feed of the fabric (11) is interrupted and a new fabric (11) is introduced from the opposite side of said chamber (13) and accompanied between the two sub-pieces which are unwound in the opposite direction from said winding rollers (122, 123) towards said unwinding rollers (22, 23), which invert their respective function.
8. Method as in claim 1, **characterized in that** when the sub-pieces (20, 21) have completely unrolled from the respective unwinding rollers (22, 23) and have wound onto the winding rollers (122, 123), said rolls are discharged and taken onto the inlet side (14) of the chamber (13) to start a new décatissage cycle.
9. Method as in claim 1, **characterized in that** when the sub-pieces (20, 21) have completely unrolled from the respective unwinding rollers (22, 23) and have wound onto the winding rollers (122, 123), the pairs of rollers (22, 23, 122 and 123) are made to rotate around said sealed chamber (13) and exchange their position, thus allowing to continue the décatissage cycle by introducing the fabric (11) always from the same side.
10. Method as in claim 1, **characterized in that** it provides that the unwinding tension of said sub-pieces (20, 21) can be regulated.
11. Method as in claim 1, **characterized in that** it provides that the pressure of the steam inside the sealed chamber (13) is between 1.1÷7 bar and that the temperature is between 102÷160 °C.
12. Method as in claim 1, **characterized in that** it provides that said fabric (11) to be treated is substantially dry with a percentage of humidity in the order of 15÷17%.
13. Method as in claim 1, **characterized in that** it provides that said fabric (11) to be treated is wet with a percentage of humidity which can reach up to 80%

of the weight of the fabric (11).

14. Method as in any claim hereinbefore, **characterized in that** it provides to make said fabric (11) and said sub-pieces (20, 21) transit, at inlet to and/or outlet from said sealed chamber (13), through at least a depression chamber (27), with a residual pressure in the order of $0.1 \div 0.5$ bar, to eliminate the air and/or fumes contained in the fabric (11) and the sub-pieces (20, 21) entering and/or leaving said sealed chamber (13). 5 10
15. Device for the décatissage of fabrics (11), comprising a sealed chamber (13) filled with steam under pressure and including at least an inlet (14) and at least an outlet (15) associated with sealing means (16), inside said chamber (13) there being at least a drawing cylinder (17) on which a fabric (11) is made to transit, **characterized in that** it comprises a first pair of unwinding rollers (22, 23) arranged on one side of said chamber (13) and able to feed respective sub-pieces of fabric (20, 21) able to accompany said fabric (11) in a sandwich from the inlet (14) to the outlet (15) of said chamber (13), and a second pair of winding rollers (122, 123), arranged on another side of said chamber (13), on which said sub-pieces (20, 21) emerging from said chamber (13) wind, said sub-pieces (20, 21) being continuous, without cross stitches and being made of a material having a high quality surface. 15 20 25 30
16. Device as in claim 15, **characterized in that** said high surface quality material is cotton, cotton/synthetic or synthetic satin, with a thickness in the order of $0.10 \div 0.70$ mm and a permeability to steam of at least 30 mm per second. 35
17. Device as in claim 15, **characterized in that** said high surface quality material is cotton, cotton/synthetic or synthetic thick flannel with a thickness in the order of $2 \div 2.5$ mm. 40
18. Device as in claim 15, **characterized in that** said drawing cylinder (17) is holed or heated. 45
19. Device as in claim 15, **characterized in that** it comprises guide cylinders (24) able to regulate the winding tension of the respective sub-pieces (20, 21). 50
20. Device as in claim 15, **characterized in that** it comprises at least a transit chamber (27), wherein a strong depression is created, arranged at inlet to and/or outlet from said sealed chamber (13). 55
21. Device as in claim 15, **characterized in that** said sealed chamber (13) is defined by the inner volume of an insulated autoclave (12).
22. Device as in claim 15, **characterized in that** the steam inside said sealed chamber (13) has a pressure of between about 1.1 and about 7 bar and a temperature of between about 102 and about 160 °C.

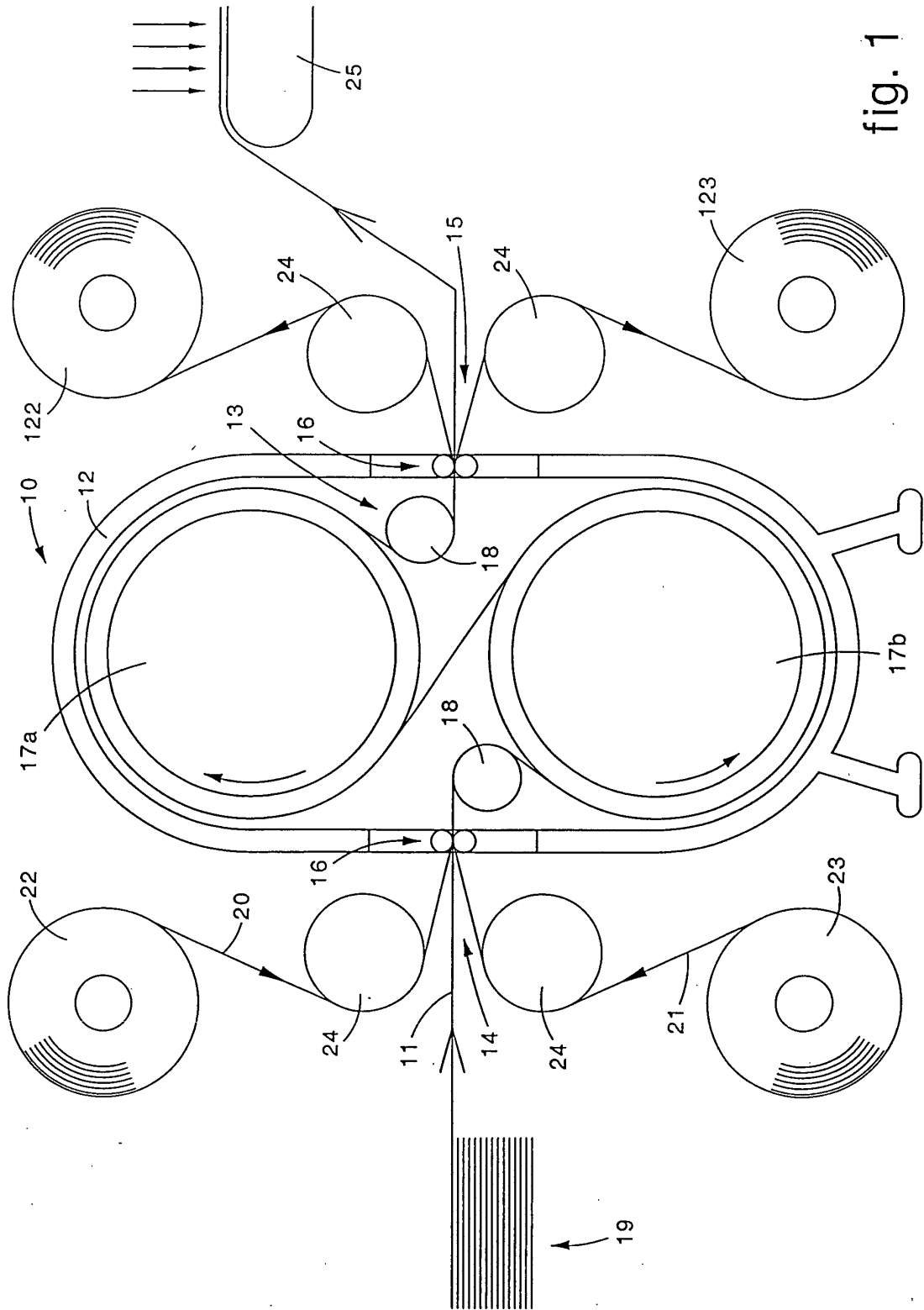


fig. 1

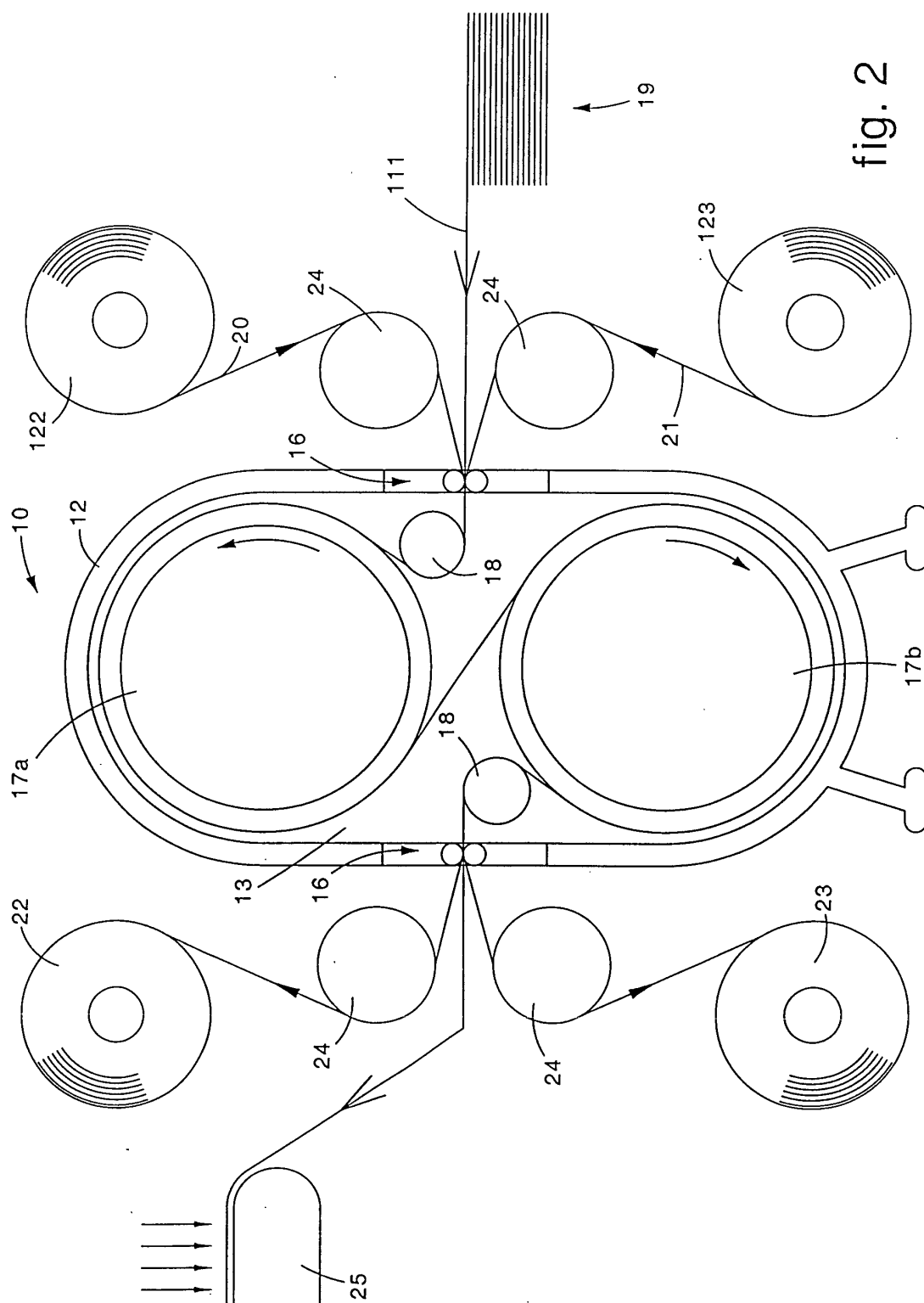


fig. 2

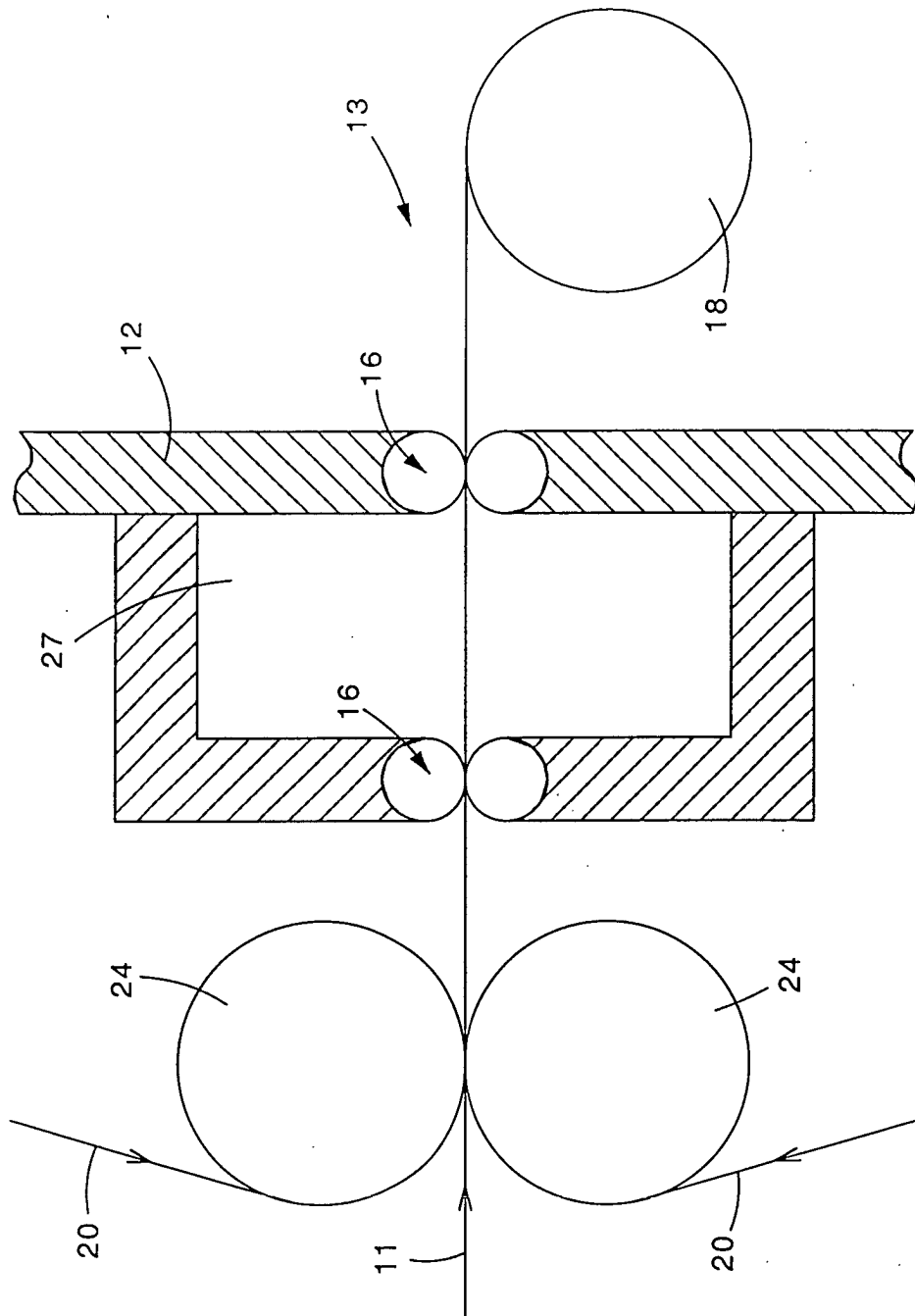


fig. 3



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**ANNEX TO THE EUROPEAN SEARCH REPORT
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