(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
09 January 2020 (09.01.2020)

WIPO | PCT

(10) International Publication Number
WO 2020/008333 A1

(51) International Patent Classification:
D04B 21/20 (2006.01) *D04B 21/18* (2006.01)

(21) International Application Number:
PCT/IB2019/055585

(22) International Filing Date:
01 July 2019 (01.07.2019)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
202018000002946 03 July 2018 (03.07.2018) IT

(71) Applicant: **CIFRA S.P.A.** [IT/IT]; Via Sabbionette, 7, 20843 Verano Brianza (MB) (IT).

(72) Inventor: **CITTERIO, Cesare**; C/O CIFRA S.P.A., Via Sabbionette, 7, 20050 Verano Brianza (MB) (IT).

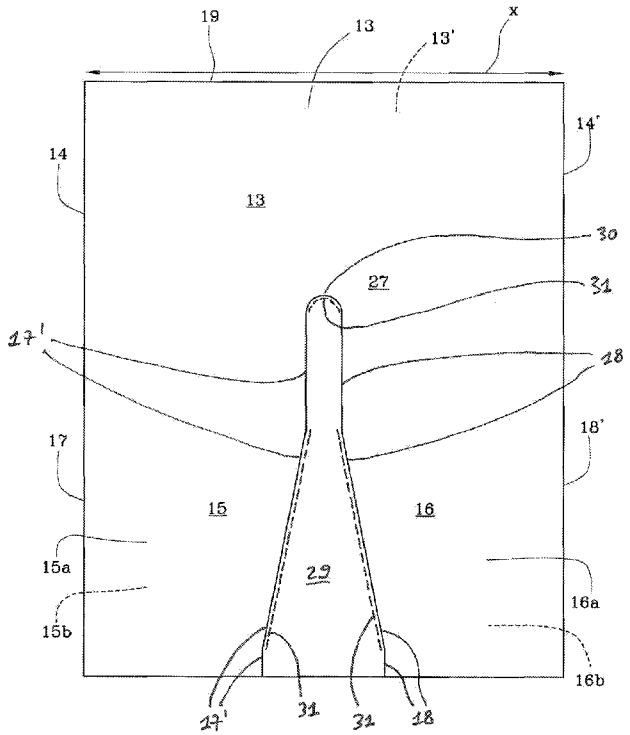
(74) Agent: **GALASSI, Alessandro**; c/o PGA S.P.A., Milano, Succursale di Lugano, Viale Castagnola 21C, 6900 Lugano (CH).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,

(54) Title: WARP KNITTED CLOTHING

FIG 6



(57) Abstract: Clothing item (1), produced on a linear textile machine of raschel type with two beds(2,2a) of needles (3) with jacquard, comprising a first substantially tubular fabric portion (13) and comprising also a second tubular fabric portion (15) and a third tubular fabric portion (16) subsequent to the first tubular portion (13) and contemporarily produced among them.The tubular portions comprise respective front parts of fabric produced on a front bed (2) and respective rear parts produced on a rear bed (2a), wherein such respective front and rear parts have been reciprocally joined during the production of them in a progressive and automatic way in correspondence of predetermined junction lines.

[Continued on next page]

WO 2020/008333 A1

EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

WARP KNITTED CLOTHING

DESCRIPTION

The present invention has as its object clothing items produced on linear textile machines and in particular on double needle bed raschel-jacquard linear machines. The invention is particularly related to outer clothing articles such as T-shirts, shorts and similar, but can be used for the realization of numerous other clothing articles. In the state of the art are known numerous methods for the realization of clothing items such as T-shirts and shorts.

A first group of production methods, of traditional type, plans to produce, through circular or also linear textile machines, a knitted fabric that is subsequently cut and sewn for realizing the finished clothing item. Such operating modes have a series of drawbacks. First of all, it has to be noted that the cutting and sewing steps of the fabrics are quite long, causing an extension of the overall production times of the clothing items and a consequently reduced efficiency. Moreover, such finishing operations are often complicated and necessarily require the intervention of human operators. It is also to be noted that the fabric cutting operations necessarily cause a certain part of scraps and then a waste of fabric. Such aspects cause then a very high cost that significantly affects the overall production cost of the clothing items. Another drawback of these proceedings is due to the characteristics of the clothing items produced with these techniques, which necessarily have a certain number of seams that often reduce the comfort for the user and worsen the overall esthetic effect.

In order to avoid such drawbacks some methods have been recently proposed for automatically producing, on electronically controlled circular textile machines, tubular knitted items that are already partially or totally finished. Such products do not need, or they need in a much reduced extent, other cutting and sewing operations for

assuming the definitive shape, thus avoiding the above mentioned drawbacks. The textile products obtained with such methods are substantially free from additional seams, because most of the seams are automatically realized by the textile machine and are not then detectable on the finished item. Such solutions permit to efficiently solve in a great number of cases the previously indicated problems, but, due to some intrinsic limits of the circular textile machines well known to the experts in the art, they do not permit to obtain any type of finished clothing item without seams. As a matter of fact, the circular textile machines do not permit the execution of some types of knitting works of the finished T-shirt, for example some types of perforated knitting works, which are on the other hand obtainable for example with raschel-jacquard linear machines. Furthermore, the circular machines do not permit to automatically execute the upper seams of T-shirts and similar, the long sleeves of T-shirts or the internal seams of shorts legs.

In this situation, the technical purpose at the basis of the present invention is to make available the clothing items realized on linear textile machines suitable for substantially avoiding the mentioned drawbacks. In particular, it is a technical purpose of the present invention to make available clothing items produced on linear textile machines which are automatically finished requesting reduced cutting operations and do not need other sewing operations. It is also a technical purpose of the present invention to make available clothing items produced on linear textile machines which have a great number of different works on the clothing items. Another technical purpose of the present invention is to make available clothing items automatically produced on linear textile machines and which do not need seams subsequent to the production in such a way as to improve the comfort and the esthetical aspects of the items themselves. It is finally a technical purpose of the present invention to make available items produced on linear textile machines in a simple and cost-effective way.

The detailed technical purpose and the specified purposes are substantially reached by clothing items produced on linear textile machines, whose characteristics are shown in the attached claims. Other characteristics and advantages of the present invention will be clearer from the detailed description of an embodiment preferred but not exclusive of clothing items produced on linear textile machines, shown in the attached drawings, wherein:

- figure 1 shows in lateral view a detail of a textile machine used for producing the item subject of the invention;
- figure 2 is a textile drawing of a short according to the present invention;
- figure 3 is a textile drawing related to a first example of embodiment of a T-shirt according to the present invention;
- figure 4 shows a variant of the drawing of figure 2;
- figure 5 is a textile drawing of another example of clothing item according to the present invention;
- figure 6 shows a variant of the first embodiment of a short according to the present invention.

The following description is written with reference to a linear textile machine, and in particular to a linear knitting machine of raschel type with double needle bed and provided with a jacquard electronic device. With descriptive and non-limiting purposes, the following description refers in particular to a linear machine of RDPJ 6/2 EL type produced by the company KARL MAYER. Such machine (not shown in the attached figures being of known type) has a gauge of twenty-fours needles/inch, i.e. twenty-fours needles per 0.0254 meters, suitable for the realization of knitting items 1, with a 138 inches comb gap, i.e. 3,5052 meters, and then with a total of 3312 needles on each bed. In such machine, the jacquard device is of piezoelectric type, and reads the information related to the movements of the related threading hooks of the combs by an opportune programmable control electronic unit.

In this way, the threading hooks of each comb are independent in their movement in such a way as to realize different weavings for each threading hook. The movement of the Jacquard combs is adjusted, further than by the piezoelectric Jacquard device, by a device provided with motors which, connected to a screw, transform the rotary movement into a horizontal translator movement of the combs with trajectories orthogonal to the warp direction. As it is visible in figure 1, the machine is provided with two parallel beds 11,11a of needles 2,3 and six combs 4,4a,5,5a,6,6a constituted by a plurality of threading hooks with related thread-guides 7,7a,8. In particular there are twenty-four thread-guides 7,7a,8 for each one-inch threading hook, suitable to feed twenty-four corresponding needles 2,3 with yarns deriving from opportune warps. In particular there are 4 external combs 4,4a,6,6a constituted by a plurality of rigid threading hooks 7,7a, of traditional type, and two inner combs 5,5a constituted by threading hooks 8 of jacquard type. The two external combs 4,4a, and eventually also the combs 6,6a, create the ground structure of the fabric, that in this case, generally but not necessarily, is a fabric chain or pillar stitch, produced in conventional way with 2-0 0-2 scheme, in correspondence of the two needle beds 2,2a, and eventually create other ground effects. The threading hooks 8 of the two jacquard combs 5,5a operate according to the information deriving from the reading of the jacquard device (not shown in the figures) and are moved by opportune displacement bars 9,9a permitting the execution of opportune drawings, according to different textile schemes, on the ground fabric realized by the threading hooks 7,7a of the external combs 4,4a,6,6a as well as the execution of opportune seams for connecting in an unique product the flat fabrics realized on the two beds 2,2a. Each needle 3 receives then two or three yarns, one from the corresponding external threading hook 7,7a and one from the inner jacquard threading hook 8. In figure 1 are also visible the needle bars 10,10a, the corresponding needle lowering bars 11,11a and the comb bars 12,12a which retain the fabric in creation.

The clothing items 1 according to the present invention can be realized through a proceeding which comprises the step of producing a first portion 13 of fabric substantially tubular. Such step is carried out through the steps of: producing a first front part 13a of fabric on a front bed 2 of the two needle beds, producing a first rear part 13b of fabric on a rear bed 2a of the two needle beds; and progressively and automatically merging the first front part 13a with the first rear part 13b in correspondence of two predetermined first junction lines 14, 14', through the thread-guides of the corresponding jacquard threading hooks which join or merge the two fabrics instead of working on the ground fabric. The proceeding comprises also the step of contemporarily producing a second portion 15 and at least a third portion 16 of tubular fabric both consecutive to the first tubular portion 13. This step is automatically carried out by the textile machine through the steps of: producing a second front part 15a and at least a third front part 16a of fabric on the front bed 2; producing a second rear part 15b and at least a third rear part 16b of fabric on the rear bed 2a and progressively and automatically merging the borders of the second front part 15a with the borders of the second rear part 15b, in correspondence of two second predetermined junction lines 17,17'; and progressively and automatically merging the borders of the third front part 16a with the borders of the third rear part 16b, in correspondence of two third predetermined junction lines 18,18', always through the jacquard threading hooks 8.

In a first embodiment the proceeding for producing clothing items 1 according to the present invention permits to realize shorts 1 and similar. In this first embodiment, shown in figure 2, the first 14,14', the second 17, 17' and the third junction lines 18, 18' are all parallel among them. In particular the first junction lines 14, 14' of the first tubular portion are coincident respectively with the second 17 and third 18' more external junction lines, whereas the second 17' and third 18 more inner junction lines are substantially side by side. Furthermore, the second 15 and the third fabric tubular

portion 16, corresponding to the legs of the shorts, are cylindrical and each one equivalent to half of the first fabric tubular portion 13, cylindrical too and corresponding to the waist line of the shorts. As it is visible in figure 2, in such embodiment the second 15 and the third 16 fabric tubular portions are adjacent to each other. In the case under consideration of a shorts realized on a machine with twenty-four needles/inch, for reasons of wearability the first fabric tubular portion 13 is produced through the use of a number of needles, indicated in figure 2 with X, equal to 550 needles per each needle bed. The second 15 and the third tubular portion 16 are produced each one through the use of a number of needles indicated in figure 2 respectively with letters Y and Z, both equal to 275 needles per bed. On the above described textile machine can be then produced for example 6,02 items in parallel. Preferably each bed of the machine is divided into 6 fields of 550 working needles, thereof only 3300 work the yarn for producing the three knitting shorts items, whereas 12 needles work producing scraps. Such embodiment is chosen for rapidly changing the type of production of the machine with other products realized with 640 needles. If the machine was designed only for the production of shorts, it would be possible to make work only 3300 needles and leave the other 12 without yarn feeding, thus avoiding the production of scraps. Advantageously, the step of producing a first substantially tubular fabric portion 13 and the step of producing a second portion 15 and at least a third tubular fabric portion 16 are continuously repeated and alternating among them on the textile machine for obtaining a continuous roll of fabric. The proceeding comprises also the step of subsequently cutting the roll of fabric thus obtained along a separation line 19 corresponding to the beginning of each first tubular fabric portion, for separating between them the textile items 1 obtained. For obtaining a shorts or similar it is possible to work for a number of weaving steps or strokes comprised between 400 and 1200. For example each shorts 1 can be produced through 772 weaving steps or strokes, thereof about 437

for the first portion and about 335 for the remaining portions. This value can vary according to the desired length of the item. It is to be noted that the number of total drafts, i.e. instructions, necessary for a shorts with 772 steps is 3088 drafts, i.e. two times 772 steps for realizing a knitting ground element, for each bed.

In a variant of the first embodiment of a shorts, shown in figure 6, the second 15 and the third 16 tubular fabric portions are realized spaced between them, with a waste tubular portion 29, having constant or variable diameter, interposed between them and designed to be removed. At least one between the first 13, the second 15 and the third 16 tubular fabric portion can have a sidecut or waisted and/or variable diameter shape. In the example of figure 6 the second 15 and the third 16 tubular fabric portion have a sidecut or waisted and variable diameter shape.

Furthermore, at least a portion of at least one of the first junction lines 14,14' can be transversally inclined with respect to the other corresponding first junction line 14', 14 and/or with respect to the direction of the fabric chain. Furthermore, at least a portion of at least one of the second junction lines 17,17' can be transversally inclined with respect to the other corresponding second junction line 17',17 and/or with respect to the direction of the fabric chain. Furthermore, at least a portion of at least one of the third junction lines 18,18' can be transversally inclined with respect to the other corresponding third junction line 18',18 and/or with respect to the direction of the fabric chain. As it is shown in the example of figure 6 the intermediate portions of the second junction line 17' and of the third junction line 18 are transversally inclined with respect to the remaining parts of the junction lines themselves and also with respect to the corresponding second and third junction lines 17 and 18'.

In this variant the shorts is provided also with an additional junction line 30 of the crotch of the shorts, preferably arched, of junction between the second 17' and the third 18 junction line. The indicated transversally inclined portions of the first, second and/or third junction lines 14,14',17,17',18,18' are advantageously provided with

cutting lines 31 (shown with dashed lines in figure 6) suitable for permitting the separation of the respective tubular portions from the waste fabric or waste tubular portion 29. The remaining portions parallel to the first, second and/or third junction lines 14,14',17,17',18,18' can be instead advantageously realized automatically separated among them, without the need of cutting lines.

In a second preferred embodiment of the present invention, shown in figure 3, 4 and 5, the proceeding for producing clothing items 1 permits to produce T-shirts and similar. In this second case, the step of producing a second portion 15 and at least a third tubular fabric portion 16 comprises also the contemporary production of a fourth tubular fabric portion 20. This fourth portion 20 is obtained through the additional steps of: producing a fourth front fabric part 20a on the front bed 2; producing a fourth rear fabric part 20b on the rear bed 2a; and progressively and automatically merging the borders of the fourth front part 20a with the borders of the fourth rear part 20b, in correspondence of two fourth predetermined junction lines 21, 21'.

In this case the second 17, 17', third 18, 18' and fourth junction lines 21, 21' are preferably parallel among them. The third tubular portion 16, which defines the body of the T-shirt, is arranged in correspondence of the central area of the first tubular portion 13, which defines the upper part of the T-shirt 1. The second 15 and the fourth tubular fabric portion 20 are arranged at the sides of the third tubular portion 16, for defining a pair of sleeves. Advantageously the first junction lines 14, 14' are curved lines, for opportunely defining the shape of the T-shirt 1 conforming it to the shoulders of the user.

Also in this case the step of producing a first fabric portion 13 and the step of producing a second 15, a third 16 and a fourth tubular fabric portion 20 are continuously repeated and alternating among them on the textile machine for obtaining a continuous roll of fabric. The roll of fabric is then subject to the cutting step along a separation line 19 corresponding to the beginning of each first tubular

fabric portion 13, for separating between them the textile items 1 obtained.

For realizing the T-shirts 1 related to the textile drawings in figure 3 and 4, the first fabric portion 13 is produced preferably through the use of X=640 needles per each needle bed, the third portion 16 is produced through the use of Z=400 needles per each bed and the second 15 and fourth tubular portion 20 are produced each one through the use of Y=K=120 needles per bed.

Advantageously, it is provided the step of cutting the clothing item 1 obtained along the first cutting lines 22, 22' adjacent to the first junction lines 14, 14' and arranged with respect to the first junction lines 14, 14' toward the outside of the clothing item 1. In this way it is avoided the exceeding fabric which is necessarily produced by the textile machine, after that the T-shirt 1 could be ready for being worn without the need of other finishing operations, eventually after being lapelled in case are used combinations of different yarn fibers for obtaining a bicolor effect through the suitable dyeing.

Advantageously it is also provided the step of cutting, along a second cutting line 23, an area of fabric in correspondence of the beginning part of the first tubular portion 13 for defining a collar.

For realizing the T-shirt related to drawing in figure 4 the proceeding for producing clothing items 1 according to the invention comprises also the step of cutting along third cutting lines 24, 24' at least partially the second 15 and the fourth tubular portion 20, for defining a clothing item 1 without sleeves or with partial sleeves.

It is to be noted that the possibility to cut the textile items 1 obtained with the present method without the need of other finishing operations derives from the intrinsic properties of the knitting stitches realized on linear machines of raschel type. On such machines each item is composed by a very high number of different yarns and the stitch, for example the web with jacquard scheme 2-0 2-4 and fabric chain or pillar 0-2 2-0, which is realized substantially results warp-knitted even if subject to

raw cut. Alternatively it is possible to provide for realizing quick finishing operations through lapel and sewing of the borders of fabric which have been cut.

For the production of T-shirts can be used a number of sewing steps or strokes comprised preferably between 500 and 1000. The T-shirts 1 related to drawings 3 and 4 are for example produced through the use of 702 knitting steps, of which respectively 270 or 290 steps for producing the first tubular portion 13 and 432 or 412 steps for the remaining tubular portions 15, 16 and 20. In this case the overall number of drafts is 2808 drafts .

In a variant of the second embodiment, shown in the textile drawing in figure 5, the proceeding permits to realize a clothing item 1 having only the third tubular fabric portion 16 contiguous to the first substantially tubular fabric portion 13, i.e. a tank top T-shirt 1.

For obtaining such tank top 1 it is possible to realize a T-shirt of the previously described type, with the first junction lines 14, 14' horizontally arranged along the same line parallel to the needle beds 2,2a, and subjecting then the T-shirt 1 to a cutting operation of the sleeves and the collar until obtaining the desired tank top along the cutting lines 23, 24 and 24'.

Alternatively, it is also possible to provide for not realizing the second portion 15 and the fourth tubular fabric portion 20, by not merging the second parts of fabric 15a, 15b and the fourth fabric parts 20a, 20b along the second 17, 17' and fourth junction lines 21, 21'. Such second 15a, 15b and fourth parts 20a, 20b can be subsequently cut as above described along third cutting lines 24, 24' for obtaining the tank top.

In this case each clothing item can be produced for example through 640 knitting steps, of which 216 steps for producing the first tubular portion 13 and 426 steps for the third tubular portion 16.

The proceeding for producing clothing items 1 according to the invention can comprise also, in all of the embodiments above shown, the step of varying the

drawing of the fabric of the clothing items 1, in at least a predetermined area of fabric with respect to the adjacent knitting areas, during the steps of producing the fabric. This step is easily realized in a conventional way through the jacquard combs which do not carry out the merging among the areas of fabric of the two beds, in accordance with the instructions of the jacquard device. As it is visible in figures from 2 to 5 in the textile drawings of the shown items are provided areas 25 with standard knit produced on the ground fabric by the jacquard threading hooks with scheme 0-2 2-0, alternating to areas 26 with tricot stitch intermediate knit with scheme 2-4 2-0 and areas 27 with thicker knit produced with scheme 2-0 4-6, provided with both esthetical and functional purposes. For producing net knitting areas 28 with openings in the knit the jacquard threading hooks repeat the scheme of the ground fabric 2-0 0-2.

Also the proceeding for producing clothing items 1 according to the invention comprises the step of adjusting the draught of the fabrics produced, for varying the density of fabric of the resulting clothing items. This adjustment is automatically carried out by the control system of the machine by varying the draught downwards on the roll of fabric produced, in such a way as to vary the number of knits per centimeter or set strokes and determine then a waisting of the products or a fabric having a different weight per square meter. A higher number of knits per centimeter corresponds to a proportionally narrower and heavier item. For reasons of wearability, each clothing item is produced in a part of the machine corresponding to 640 needles per bed, so that on the linear machine under consideration are produced contemporarily in parallel 5,17 clothing items 1, opportunely spaced among them. In the case of T-shirts which are each one produced with 640 needles, only 3200 needles per bed effectively work the product, whereas 112 needles per bed, corresponding to 4,66 threading hooks, work freely, i.e. without yarn. The threading hooks which do not work the knitting items can be equally arranged in any position

on the machine. Thus, each item of 640 needles is realized by using 1280 structure yarns or fabric chains and likewise jacquard yarns. As a total for each product are used 2560 yarns. In the case of shorts which is produced with 550 needles, each item is realized with 2200 yarns.

Regarding the materials used for the yarns, the item can be composed for example mainly (around 79%) by PA 6.6 (polyamide) and by a percentage around 21% of PUE (elastomer).

Furthermore the clothing item can be realized through the use of at least an elasticized fiber, chosen in the following group of fibers, with a GSM value (grams per square meter) of the fabric corresponding to:

- fiber 81% Nylon 6.6 and 19% Elastane (Lycra) and a GSM value of the fabric from 230 to 320 g/m^2;
- fiber 76% Nylon 6.6 and 24% Elastane (Lycra) and a GSM value of the fabric from 270 to 365 g/m^2;
- fiber 34% Polyester Cationic, 49% Nylon 6.6 and 17% Elastane (Lycra) and a GSM value of the fabric from 230 to 320 g/m^2;
- fiber 53% Polyester Cationic, 37% Nylon 6.6 and 10% Elastane (Lycra) and a GSM value of the fabric from 200 to 255 g/m^2;
- fiber 44% Polypropylene (Dryarn), 44% Nylon 6.6, 12% Elastane (Lycra) and a GSM value of the fabric from 195 to 255 g/m^2;
- fiber 65% Merino Wool, 31% Nylon 6.6, 4% Elastane (Lycra) and a GSM value of the fabric from 330 to 400 g/m^2;
- fiber 54% Merino Wool, 39% Nylon 6.6, 7% Elastane (Lycra) and a GSM value of the fabric from 230 to 300 g/m^2;
- special fiber 81% Nylon 6.6 (Emana), 19% Elastane (Lycra) and a GSM value of the fabric from 225 to 290 g/m^2;
- ecological fiber 82,5% Nylon 6 Econyl, 17,5% Elastane (Lycra) and a GSM value of

the fabric from 230 to 320 g/m^2;

- ecological fiber 81% Nylon 6.6 (Q-Nova), 19% Elastane (EA Roica V550 Eco Friendly) and a GSM value of the fabric from 230 to 320 g/m^2.

Alternatively the clothing item can be realized through the use of at least one non-elasticized textile fiber, chosen in the following group of fibers, with a GSM value (grams per square meter) of the fabric corresponding to:

- microfiber 100% Nylon 6.6 and a GSM value of the fabric from 155 to 200 g/m^2;
- fiber 54% Nylon 6.6 and 46% Polyester Cationic and a GSM value of the fabric from 150 to 200 g/m^2;
- fiber 78% Nylon 6.6 and 22% Polyester and a GSM value of the fabric from 155 to 225 g/m^2;
- fiber 49% Nylon 6.6, 26% Wool and 25% Tencel and a GSM value of the fabric from 130 a 200 g/m^2;
- fiber 44% Merino Wool and 56% Nylon 6.6 (Lycra) and a GSM value of the fabric from 125 to 175 g/m^2;
- special fiber 100% Nylon 6.6 (Breeze) and a GSM value of the fabric from 150 to 190 g/m^2;
- ecological fiber 100% Nylon (bio-based Evo) and a GSM value of the fabric from 155 to 200 g/m^2;
- ecological fiber 100% Nylon 6.6 (Q-Nova) and a GSM value of the fabric from 145 to 200 g/m^2.

The invention permits to obtain important advantages. First of all, the invention permits to automatically realize finished clothing items on linear textile machines. In particular the invention notably reduces the cutting operations and does not require other item sewing operations, by reducing both times and costs of production of the clothing items. It is also to be noted that the invention permits then to notably improve the comfort and the esthetical aspect of the items themselves. Furthermore, the

invention permits to produce clothing items provided with a high number of different workings. Eventually, it is to be underlined that the present invention is easily realized and that also the cost connected to the realization of the invention is not very high.

The so thus conceived invention is susceptible of various changes and variants, all of them within the scope of the inventive concept characterizing it. All the details are replaceable by other equivalent technical elements and practically all the used materials, as well as the sizes, may be any according to the needs.

CLAIMS

1) Clothing items (1) produced on a linear textile machine, in particular of raschel type with two beds (2,2a) of needles (3) with jacquard device, wherein the clothing item comprises:

a first substantially tubular fabric portion (13) having a first front fabric part (13a) produced on a front bed (2) of said two beds (2,2a) of needles (3), a first rear fabric part (13b) produced on a rear bed (2a) of said two beds (2,2a) of needles (3); wherein the first front part (13a) and the first rear part (13b) are reciprocally joined during their production in a progressive and automatic way in correspondence of predetermined junction lines (14,14'); and wherein the clothing item (1) comprises also a second tubular fabric portion (15), having a second front part (15a) and a second rear part (15b), and at least a third tubular fabric portion (16), having a third front fabric part (16a) and a third rear fabric part (16b), the second portion (15) and the third portion (16) being consecutive to the first tubular portion (13) and being contemporarily produced between them, wherein the second front part (15a) and at least the third front fabric part (16a) are produced on the front bed of needles (3) and wherein the second rear part (15b) and the third rear fabric part (16b) are produced on the rear bed of needles (3), the borders of the second front part (15a) and the borders of the second rear part (15b) being reciprocally joined during their production progressively and automatically in correspondence of two second predetermined junction lines (17,17'); and the borders of the third front part (16a) and the borders of the third rear part (16b) being reciprocally joined during their production progressively and automatically in correspondence of two third predetermined junction lines (18,18').

2) Clothing item according to claim 1 characterized in that it is realized through the use of at least an elasticized textile fiber, chosen in the following group of fibers, with a GSM value (grams per square meter) of the fabric corresponding to:

- fiber 81% Nylon 6.6 and 19% Elastane (Lycra) and a GSM value of the fabric from 230 to 320 g/m^2;

- fiber 76% Nylon 6.6 and 24% Elastane (Lycra) and a GSM value of the fabric from 270 to 365 g/m^2;

- fiber 34% Polyester Cationic, 49% Nylon 6.6 and 17% Elastane (Lycra) and a GSM value of the fabric from 230 to 320 g/m^2;

- fiber 53% Polyester Cationic, 37% Nylon 6.6 and 10% Elastane (Lycra) and a GSM value of the fabric from 200 to 255 g/m^2;

- fiber 44% Polypropylene (Dryarn), 44% Nylon 6.6, 12% Elastane (Lycra) and a GSM value of the fabric from 195 to 255 g/m^2;

- fiber 65% Merino Wool, 31% Nylon 6.6, 4% Elastane (Lycra) and a GSM value of the fabric from 330 to 400 g/m^2;

- fiber 54% Merino Wool, 39% Nylon 6.6, 7% Elastane (Lycra) and a GSM value of the fabric from 230 to 300 g/m^2;

- special fiber 81% Nylon 6.6 (Emana), 19% Elastane (Lycra) and a GSM value of the fabric from 225 to 290 g/m^2;

- ecological fiber 82,5% Nylon 6 Econyl, 17,5% Elastane (Lycra) and a GSM value of the fabric from 230 to 320 g/m^2;

- ecological fiber 81% Nylon 6.6 (Q-Nova), 19% Elastane (EA Roica V550 Eco Friendly) and a GSM value of the fabric from 230 to 320 g/m^2.

3) Clothing item according to claim 1 characterized in that it is realized through the use of at least one non-elasticized textile fiber, chosen in the following group of fibers, with a GSM value (grams per square meter) of the fabric corresponding to:

- microfiber 100% Nylon 6.6 and a GSM value of the fabric from 155 to 200 g/m^2;

- fiber 54% Nylon 6.6 and 46% Polyester Cationic and a GSM value of the fabric from 150 to 200 g/m^2;

- fiber 78% Nylon 6.6 and 22% Polyester and a GSM value of the fabric from 155 to

225 g/m^2;

- fiber 49% Nylon 6.6, 26% Wool and 25% Tencel and a GSM value of the fabric from 130 to 200 g/m^2;

- fiber 44% Merino Wool and 56% Nylon 6.6 (Lycra) and a GSM value of the fabric from 125 to 175 g/m^2;

- special fiber 100% Nylon 6.6 (Breeze) and a GSM value of the fabric from 150 to 190 g/m^2;

- ecological fiber 100% Nylon (bio-based Evo) and a GSM value of the fabric from 155 to 200 g/m^2;

- ecological fiber 100% Nylon 6.6 (Q-Nova) and a GSM value of the fabric from 145 to 200 g/m^2.

4) Clothing item according to claims 1, 2 or 3 characterized in that it is a shorts or similar.

5) Clothing item according to any of the claims from 1 to 4 characterized in that the second (15) and the third (16) tubular fabric portions are realized adjacent between them.

6) Clothing item according to any of the claims from 1 to 5 characterized in that at least a portion of at least one portion of said first junction lines (14,14') is transversally inclined with respect to the corresponding other first junction line (14', 14) and/or with respect to the direction of the fabric chain.

7) Clothing item according to any of the claims from 1 to 6 characterized in that at least one portion of at least one of said second junction lines (17,17') is transversally inclined with respect to the corresponding other second junction line (17',17) and/or with respect to the direction of the fabric chain.

8) Clothing item according to any of the claims from 1 to 7 characterized in that at least one portion of at least one of said third junction lines (18,18') is transversally inclined with respect to the corresponding other third junction line (18',18) and/or with

respect to the direction of the fabric chain.

9) Clothing item according to any of the claims from 1 to 8 characterized in that at least one of said first (13) second (15) and/or third (16) tubular fabric portions has a sidecut or waisted and/or variable diameter shape.

10) Clothing item according to any of the claims from 1 to 9 characterized in that the second (15) and the third (16) tubular fabric portions are realized spaced between them, with a waste tubular portion (29), having constant or variable diameter, interposed between them and destined to be removed and/or in that it is provided an additional line (30) of junction of the crotch of the shorts, preferably arched, of junction between one of the second (17') and one of the third (18) junction lines.

11) Clothing item according to any of the claims from 1 to 4 characterized in that the first (14,14'), the second (17,17') and/or the third junction lines (18,18') are parallel to each other and/or in that each of said second (15) and third (16) tubular fabric portions corresponds to half of the first tubular fabric portion (13).

12) Clothing item according to any of the claims from 1 to 11 characterized in that the production of the first substantially tubular fabric portion (13) and the production of the second tubular fabric portion (15) and of the third tubular fabric portion (16) are repeated continuously and alternated to each other on the textile machine for obtaining a continuous roll of fabric.

13) Clothing item according to any of the claims from 1 to 12 characterized in that the roll of fabric obtained from the machine is subsequently cut along a separation line (19) corresponding to the beginning of each first tubular fabric portion (13), for separating the clothing items (1) obtained from each other.

14) Clothing item according to any of the claims from 1 to 3 or from 5 to 13 characterized in that it is a T-shirt (1) or similar.

15) Clothing item according to any of the claims from 1 to 14 characterized in that it comprises also a fourth tubular fabric portion (20) contemporarily produced with the

production of the second tubular fabric portion (15) and of the third tubular fabric portion (16) and/or in that the fourth portion (20) is provided with a fourth front fabric part (20a) produced on the front needle bed (3) and of a fourth rear fabric part (20b) produced on the rear needle bed (3), the borders of the fourth front part (20a) and the borders of the fourth rear part (20b) being reciprocally joined during the their production progressively and automatically in correspondence of two fourth predetermined junction lines (21,21').

16) Clothing item according to claim 14 or 15 characterized in that the second (17,17'), third (18,18') and fourth junction lines (21,21') are all parallel to each other and/or in that the third tubular fabric portion (16) is arranged centrally with respect to the first tubular portion (13), whereas the second (15) and the fourth tubular fabric portions (20) are arranged at the sides of the third tubular portion (16) for defining a pair of sleeves.

17) Clothing item according to any of the previous claims characterized in that the first junction lines (14,14') are curved lines, defining the shape of the clothing item (1).

18) Clothing item according to any of the claims from 14 to 17 characterized in that the production of the first substantially tubular fabric portion (13) and the production of the second tubular fabric portion (15), of the third tubular fabric portion (16) and of the fourth tubular fabric portion (20) are repeated in a continuous manner and alternated to each other on the textile machine for obtaining a continuous roll of fabric.

19) Clothing item according to any of the previous claims characterized in that the roll of fabric obtained from the machine is subsequently cut along a separation line (19) corresponding to the beginning of each first tubular fabric portion (13), for separating the clothing items (1) obtained from one another.

20) Clothing item according to any of the previous claims characterized in that it is

realized on a linear machine having fineness of the needles (3) of 24 needles/inch and/or in that the first substantially tubular fabric portion (13) is produced through the use of 640 needles (3) per each needle bed (3), the third portion (16) is produced through the use of 400 needles (3) for each bed and said second and fourth tubular portion (20) are produced each one through the use of 120 needles (3) per bed.

21) Clothing item according to any of the previous claims characterized in that it is obtained by cutting also the item obtained by the textile machine along the first cutting lines (22,22') adjacent to the first junction lines (14,14') and arranged with respect to the first junction lines (14,14') toward the outside of the clothing item (1).

22) Clothing item according to any of the previous claims characterized in that it is obtained by cutting an area of fabric of the article along a second cutting line (23) in correspondence of the initial part of said first tubular portion (13) for defining a collar.

23) Clothing item according to any of the claims from 14 to 22 characterized in that it is a clothing item (1) without sleeves or with partial sleeves obtained by cutting at least partially the second (15) and the fourth tubular portion (20) along the third cutting lines (24,24').

24) Clothing item according to any of the previous claims characterized in that it is produced through a number of knitting steps or strokes comprised between 500 and 1000.

25) Clothing item according to claim 24 characterized in that it is produced through 702 knitting steps, of which a number comprised between 270 and 290 steps for producing said first tubular portion (13) and a number comprised between 432 and 412 steps for the remaining tubular portions (15, 16, 20).

26) Clothing item according to claim 14 characterized in that the second parts of fabric (15a,15b) and the fourth parts (20a,20b) of fabric are not joined along the second (17,17') and fourth junction lines (21,21') and are subsequently cut along third cutting lines (24,24') , in such a way as to obtain a clothing item (1) having only

the third tubular fabric portion (16) contiguous to the first substantially tubular fabric portion (13).

27) Clothing item according to claim 26 characterized in that it is produced through 642 steps, of which 216 steps for producing said first tubular portion (13) and 426 steps for the third tubular portion (16).

28) Clothing item according to any of the previous claims characterized in that it comprises a stitch of variable type and then a drawing of the fabric differentiated in at least a predetermined part of fabric with respect to the adjacent knitting parts, through the variation of the type of the stitch realized during the production of the fabric.

29) Clothing item according to any of the previous claims characterized in that it is produced with a size defined also through the adjustment of the draught of the fabrics produced during the production on the textile machine.

30) Clothing item according to any of the previous claims characterized in that is realized on a linear machine having globally 3312 needles (3) on each bed and in that on the machine are contemporarily produced in parallel at least three clothing items (1), opportunely spaced from each other.

31) Clothing item according to any of the previous claims characterized in that it is realized on a linear machine having fineness of the needles (3) of 24 needles/inch and/or in that the first substantially tubular fabric portion (13) is produced through the use of 550 needles (3) per each needle bed (3) and/or in that each of said second (15) and third tubular portion (16) is produced through the use of 275 needles (3) per bed.

32) Clothing item according to any of the previous claims characterized in that each clothing item (1) is produced with a number of knitting steps or strokes comprised between 400 and 1200.

FIG 1

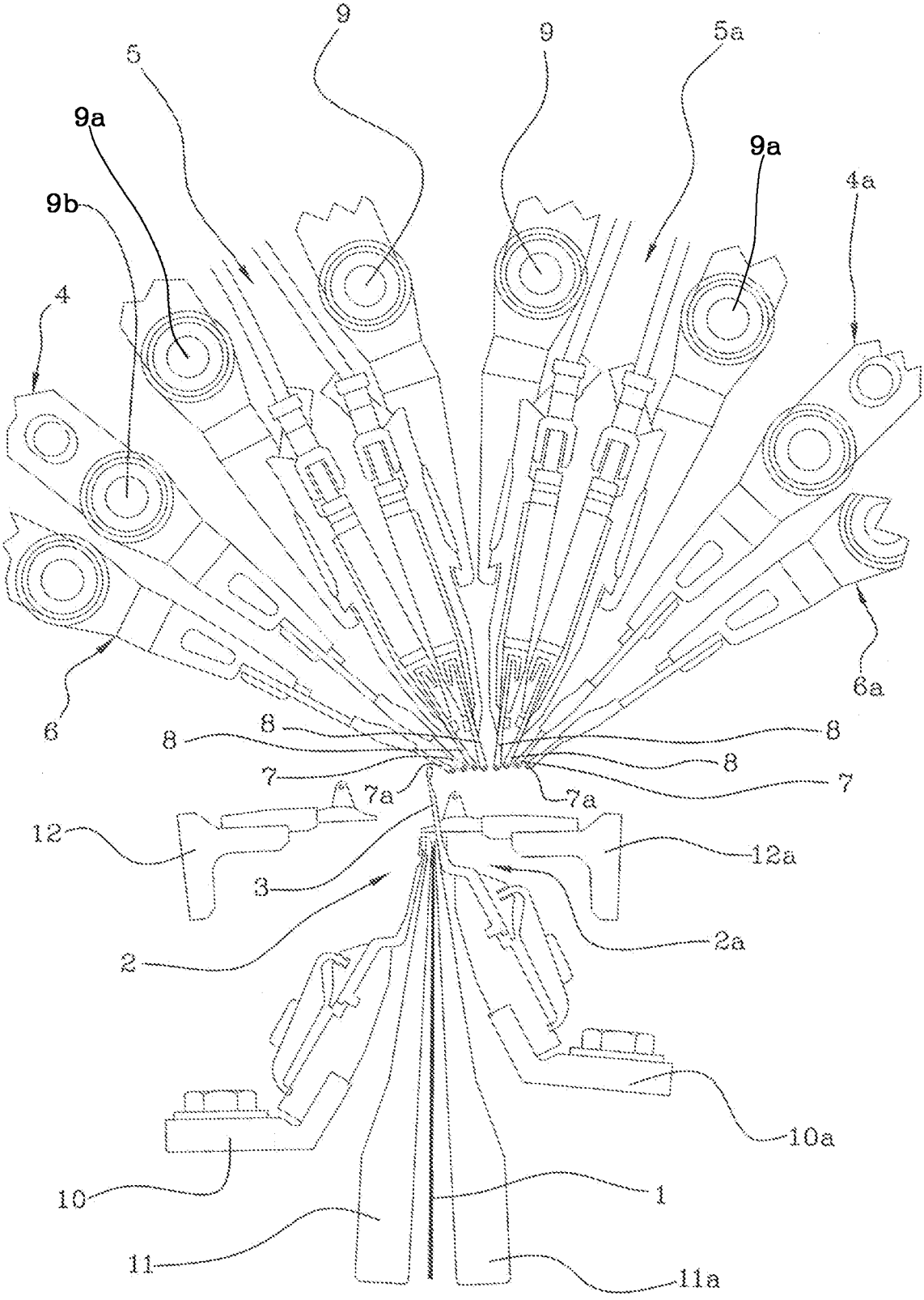


FIG 2

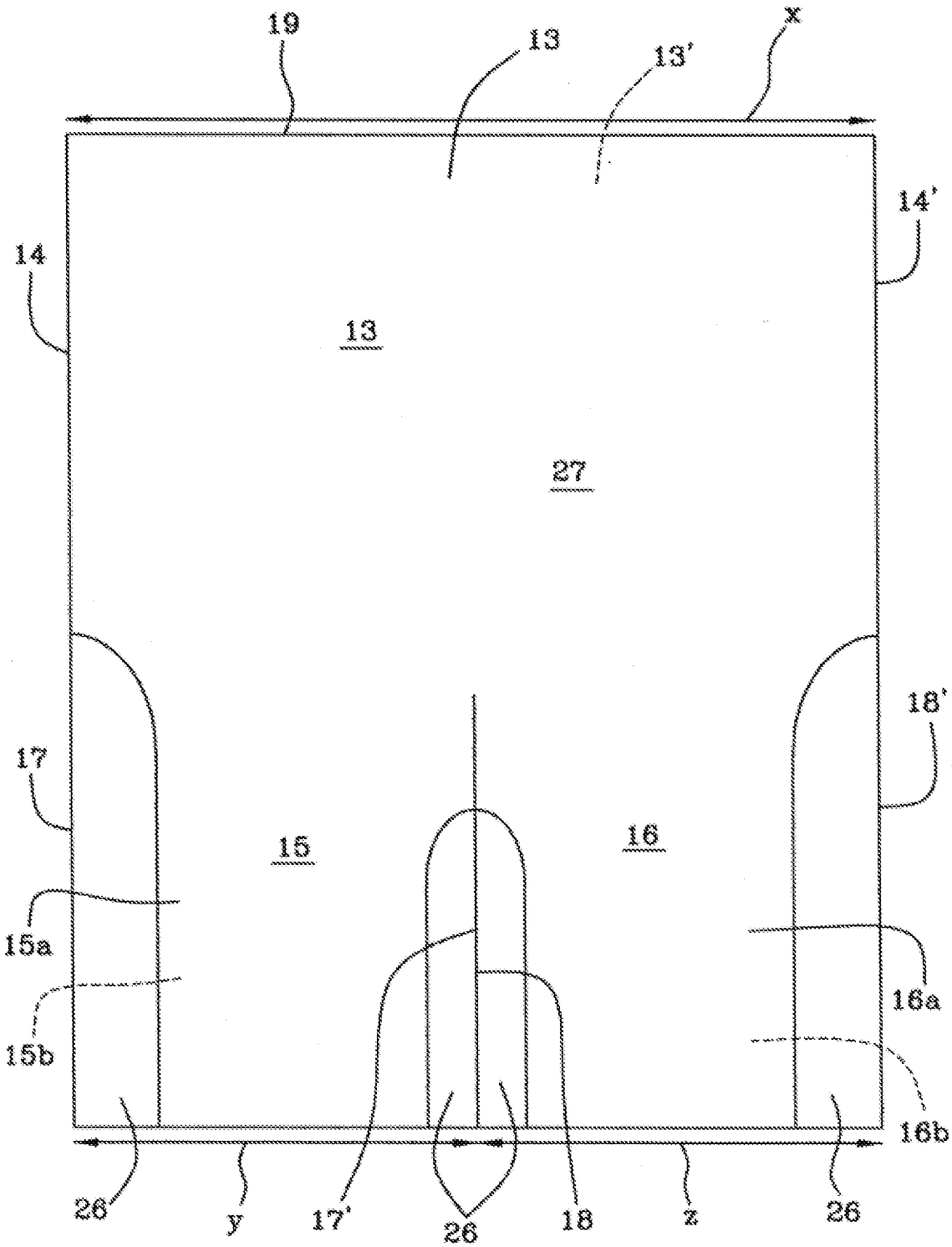


FIG 3

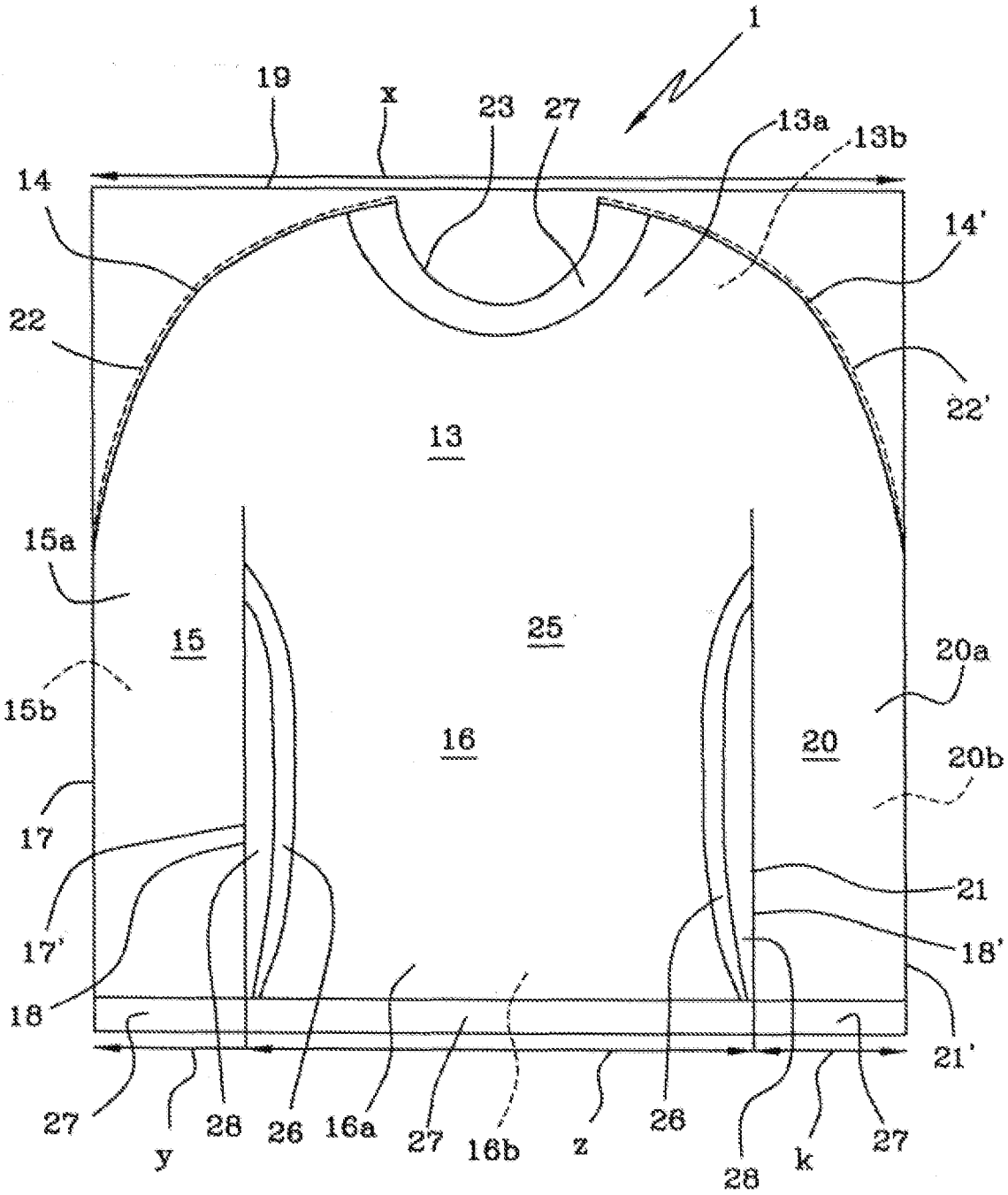

1
19
x
23
27
13a
13b
14
14'
22
22'
13
15a
15
25
20a
15b
16
20
20b
17
21
17'
18'
18
21'
27
y
28
26
16a
27
16b
z
26
28
k
27

FIG 4

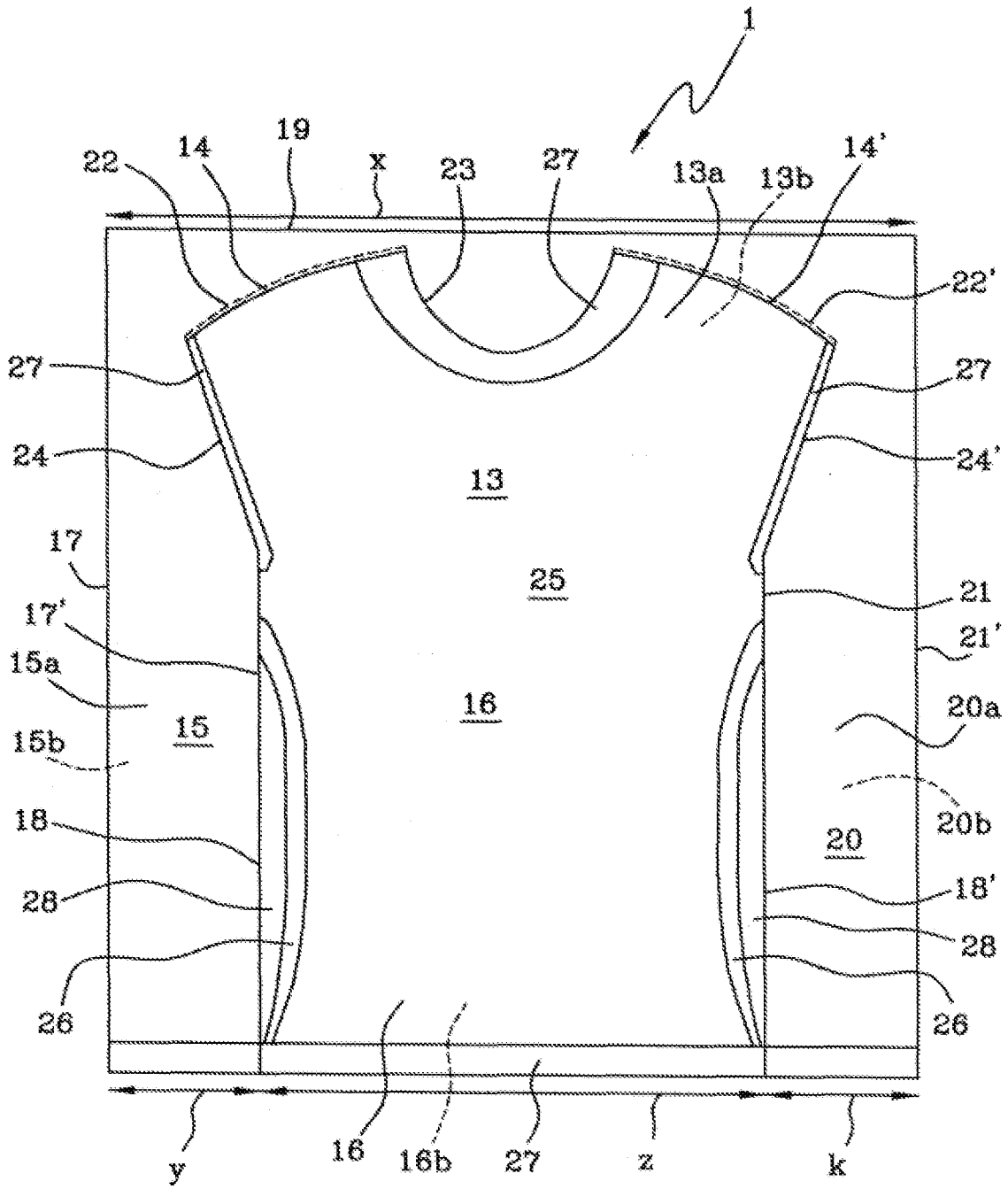

1
22
14
19
x
23
27
13a
13b
14'
22'
27
27
24
24'
13
17
25
21
17'
21'
15a
16
20a
15
15b
20b
18
20
18'
28
28
26
26
y
16
16b
27
z
k

FIG 5

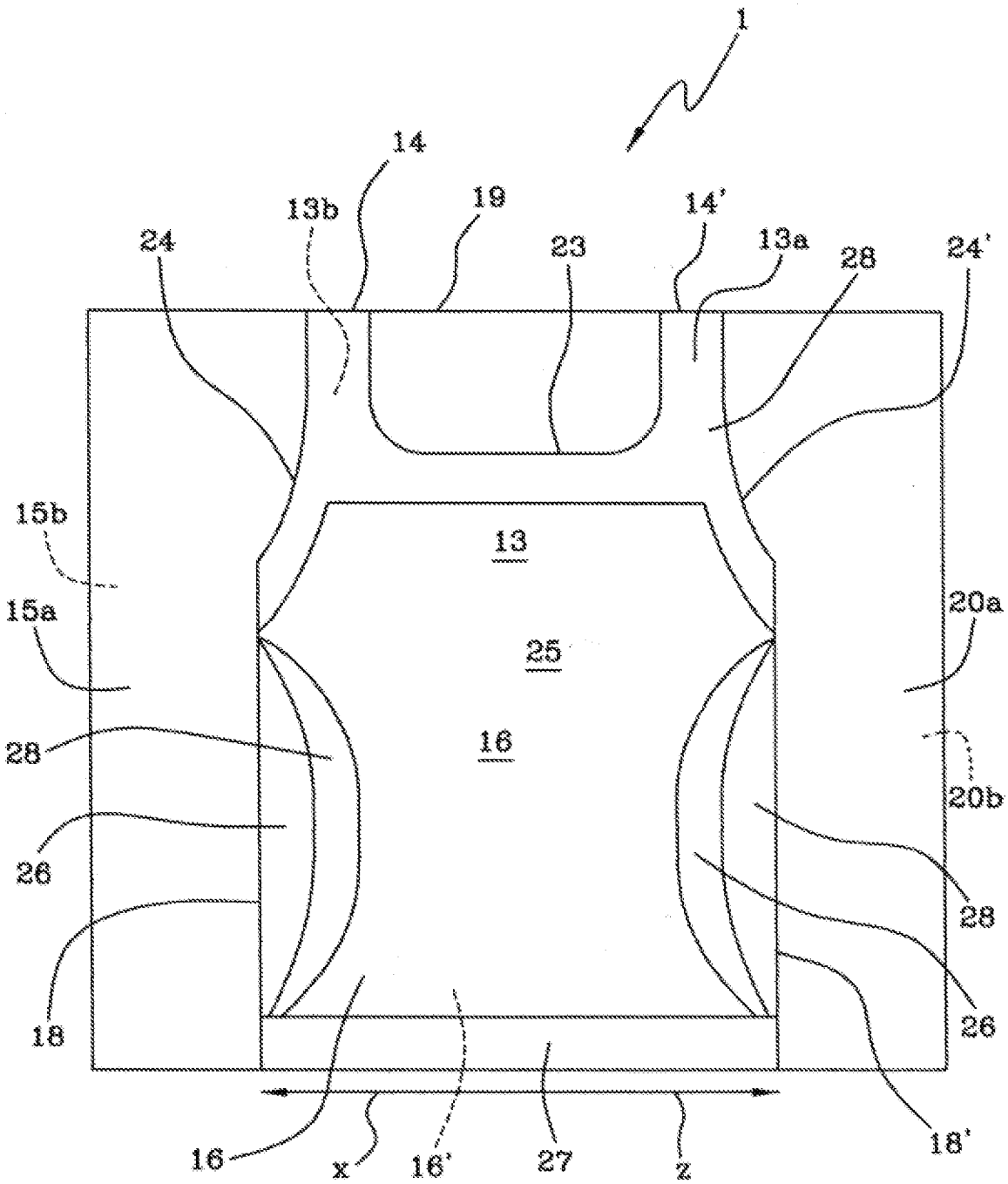
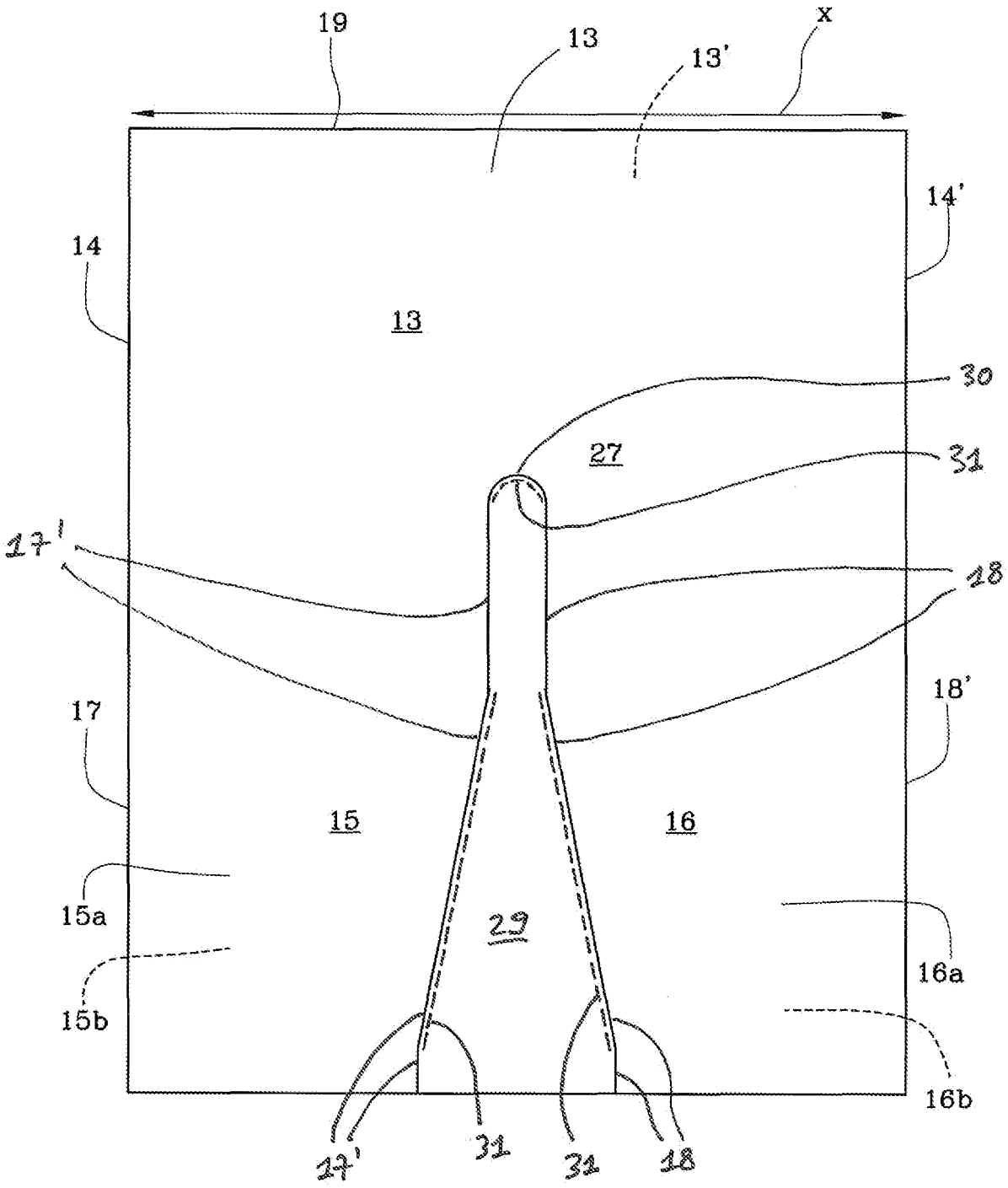

1
14
13b
19
14'
24
23
13a
28
24'
15b
13
15a
20a
25
16
28
20b
26
28
18
26
16
x
16'
27
z
18'

FIG 6


19
13
13'
x
14'
14
13
30
27
31
17'
18
18'
17
15
16
15a
29
16a
15b
16b
17'
31
31
18

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/055585

A. CLASSIFICATION OF SUBJECT MATTER
INV. D04B21/20 D04B21/18
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2012 180620 A (YOSHIDA INDUSTRY CO) 20 September 2012 (2012-09-20)	1,4-6,9, 11-22, 24-32
A	paragraphs [0024] - [0060]; claims 4-7, 10, 11; figures 1-6, 11	7,8

X	EP 1 876 274 A1 (SEIREN CO LTD [JP]) 9 January 2008 (2008-01-09)	1,4,5, 10-16, 18-20, 24,25, 28-32
	paragraphs [0011] - [0045]; claims 1-4; figures 1-11	

	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 September 2019	11/10/2019

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Sterle, Dieter

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/055585

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 389 850 B1 (FUJIWARA TOSHIO [JP]) 21 May 2002 (2002-05-21)	1,5-9, 11-20, 22-32
A	column 1, line 56 - column col.6, line 24; claims 2, 6; figures 1-5B, 10, 11 column 8, lines 59-64; figure 7	10

X	US 3 774 416 A (IITONE S) 27 November 1973 (1973-11-27)	1,4,5, 10-16, 18-20, 22-32
A	column 2, line 31 - column 11, line 3; claim 1; figures 1, 2a, 2b, 6a, 6b, 13-15, 17, 19	6-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2019/055585

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2012180620 A	20-09-2012	NONE	
EP 1876274 A1	09-01-2008	CN 101146943 A	19-03-2008
		EP 1876274 A1	09-01-2008
		JP 4607955 B2	05-01-2011
		JP WO2006106975 A1	25-09-2008
		KR 20070118231 A	14-12-2007
		US 2009064721 A1	12-03-2009
		WO 2006106975 A1	12-10-2006
US 6389850 B1	21-05-2002	JP 3286787 B2	27-05-2002
		JP 2001115358 A	24-04-2001
		US 6389850 B1	21-05-2002
US 3774416 A	27-11-1973	NONE	