METHOD FOR THE AUTOMATED PRODUCTION OF T-SHIRTS

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ABSTRACT

The present invention relates to a set of items comprising stiff templates (120-122), counter-templates (123) and hollow punches (124-126) appropriately adapted for producing T-shirts, and their fully automated production process, by means of the above-mentioned set of members.

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METHOD FOR THE AUTOMATED PRODUCTION OF T-SHIRTS

FIELD OF THE INVENTION

[0001] The present invention relates to the clothing industry, in particular to T-shirts, and their method of production.

PRIOR ART

[0002] T-shirts are without doubt one of the most widely worn articles of clothing: having been originally conceived for use as underwear or work clothing, they have now become widespread—particularly in the summer—as a dress article that is highly valued for its lightness and practicality. T-Shirts are produced from solid-colour or patterned fabrics woven from natural or artificial fibres having normally reduced thickness.

[0003] Various types of T-shirts exist (round-necked, V-necked or women’s low-necked T-shirts, raglan shirts etc.), but the unifying and distinctive feature is that in all cases they are an article of clothing which covers the torso of the person wearing it as well as at least partially the arms, since they can have long or short sleeves.

[0004] The T-shirt in particular is a shirt having a straight-cut or curvilinear body from the upper part of which the sleeves originate, giving it the aforementioned characteristic T-shape, and with a round neck.

[0005] Through examination of the structure of a T-shirt of the above-mentioned type, and with reference to FIGS. 1A and 1B, it is noted that, notwithstanding its apparent simplicity, a T-shirt according to the prior art consists of 5 pieces of fabric (3 in the case of the body being obtained from a tube of fabric):

- chest (101), back (102), two sleeves (103), and one collar (104), which must be stitched together. In particular the chest (101) and the back (102) are sewn together along the shoulders and down the sides, thus creating the seams (105) and (106) respectively on the shoulders and along the sides, so constituting the body covering. In the upper part of the body, where there are present round templates suitable for the sleeves, the two pieces of fabric, chest and back, are left unsown, leaving the opening for the arm to pass through. Analogously, above the shoulders, where there is the rounded template for the collar, chest and back are not sewn so as to leave an opening for the head to go through. For application of the sleeves, the sleeves (103), whether long or short, are each stitched one side to the other in the form of a tube, creating the seams (109), and stitched to the chest and back, thus creating the seams (107), and finally the collar (104) is applied, thus creating the seams (108).

[0007] A conventional T-shirt also has seams (110) and (111) of the hems formed on the extremities of the body and sleeves.

[0008] The seams for manufacture of a T-shirt are generally formed manually using a sewing machine with a needle and thread.

[0009] Because a large proportion of the cost of the article is linked to the manual labour involved in making it up, there is a perceived need to simplify and possibly automate the production process.

SUMMARY OF THE INVENTION

[0010] With reference to the drawings, the subject of the present invention is a set of items comprising stiff templates for the chest (120), the back (121) and the sleeves (122), counter-templates for the sleeves (123), and corresponding hollow punches for cutting a fabric in the shape of a chest (124), back (125) and sleeves (126), said set of members being appropriately pre-arranged for the composition of a shirt. The present invention further relates to a process for producing T-shirts, said process comprising the use of at least one set of members according to the present invention.

[0011] For the composition of the T-shirt, the fabric of which it is made is caused to adhere to the templates (120), (121) and (122) and stiff counter-templates (123), positioned adjacent to the stiff templates (122), and punched by means of the corresponding hollow punches (124), (125) and (126). The stiff templates (120)-(122) enable the assembled components of the shirt (101), (102) and (103), to be rendered treatable in the same way as a specific mechanism, by eliminating all the variations associated with the flexibility and inconsistency of the fabric.

[0012] Due to use of the stiff templates (120)-(122), the process according to the invention enables full automation of the shirt production process so as to be able to produce 10,000 shirts per day with a considerable reduction in the cost of manual labour for the product. Furthermore, the process of the present invention offers quality guarantees and consistency of the finished product, as well as trackability thereof from cutting to packaging, guaranteeing the maximum control at each step of production, and also offers the possibility of Just-In-Time production, reducing the use and space requirement of a storage warehouse.

[0013] The process of the present invention allows improvement of the quality of the product in terms of dimensional uniformity of each size. The subject of the present invention is also a T-shirt obtained by the above-mentioned process, said T-shirt having the various pieces of fabric glued together by means of a suitable adhesive medium and not by sewing with a needle and thread.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIGS. 1A and 1B are, respectively, schematic illustrations of a conventional T-shirt and of the various separate components thereof;

[0015] FIG. 2 shows, according to the invention and (A) in a top view, the stiff templates of the chest and back (120) and (121), according to the present invention, which templates are arranged on a pallet (140), lying in contact with one another along one side; (B) shows a detail of a movable portion (130) in an advanced position, for punching; (C) shows the detail of a movable portion (130) in a retracted position, for creation of the “curl” (135);

[0016] FIG. 3 shows, in accordance with the invention, the stiff templates of the chest and back (120) and (121), brought adjacent to the one another along one side, and their possible superposition by overturning or closing like a book by folding along the axis (143);

[0017] FIG. 4 shows, according to the invention, (A) the stiff templates of the chest and back (120) and (121) and the respective punches for the chest and back (124) and (125); (B) shows a bolt of fabric (142) arranged above the stiff templates of the chest and back (120) and (121), ready to be cut by the respective punches of the chest and of the back (124) and (125);

[0018] FIG. 5 shows, according to the invention, the distribution of an adhesive means along the side edges (143) and (144) and the top edges (145) and (146) of the chest (101) and
of the back (102) punched directly onto the respective stiff templates for the chest and the back (120) and (121); panel A shows in detail the movable portions (130), which have been retracted for formation of the curls (135); panel B shows a curl (135) in detail, covered with an adhesive medium;

0019 FIG. 6 shows, according to the invention, the superposition of the stiff template of the back (121) bearing the back (102) on the stiff templates of the chest (120) bearing the chest (101) to obtain the front/back template sandwich (138);

0020 FIG. 7 shows, according to the invention, (A) positioned on a pallet (141), a stiff template of a sleeve (122) and the respective counter-template (123), which are located at a distance in a post-punch position; (B) the punching of a bolt of fabric (142) fixed on top of a stiff template for the sleeves that is adjacent to the respective counter-template (123); (C) the sleeve (103) punched and stretched out over the surface of a stiff template (122);

0021 FIG. 8 shows, according to the invention, (A) a punch for the sleeves (126) above the respective stiff template of a sleeve (122) and the respective counter-template (123), which are positioned on a pallet (141), adjacent in the punching position; (B) the punching of a bolt of fabric (142) fixed on top of a stiff template for the sleeves that is adjacent to the respective counter-template (123); (C) the sleeve (103) punched and stretched out over the surface of a stiff template (122);

0022 FIG. 9 shows, according to the invention, (A) the distribution of an adhesive means along the side edges (147) of a sleeve (103) punched directly onto the respective stiff template of the sleeves (122); the detail B shows in detail a curl (136) covered with adhesive medium;

0023 FIG. 10 shows, according to the invention, (A) the superposition of the two stiff semi-templates of which a stiff template for the sleeves (122) is composed; (B) the stiff template sandwich of a sleeve (139);

0024 FIG. 11 shows, according to the invention, the assembly of the front/back stiff template sandwich (138) with the stiff template sandwich of the sleeves (139);

0025 FIG. 12 shows a T-shirt obtained by the process according to the invention.

**DETAILED DESCRIPTION OF THE INVENTION**

0026 For the purposes of the present invention, T-shirt means a T-shirt (with a round neck, V-neck or women’s low-neck), a raglan shirt or similar articles of clothing adapted to cover the torso. Said T-shirt according to the invention may be long-sleeved or short-sleeved.

0027 According to the present invention, the stiff templates and counter-templates are preferably planar.

0028 According to the present invention, said set of items comprising stiff templates and corresponding hollow punches and counter-templates advantageously pre-arranged for the production of a shirt, said set comprising:

0029 at least one stiff template for the chest (120) having substantially the form of the chest (101) of the shirt, said template being adapted to contain, hold and transport a stretched out piece of fabric shaped like the model of the chest (101) of the shirt;

0030 at least one stiff template for the back (121) having substantially the shape of the back (102) of the shirt, said template being adapted to contain, hold and transport a stretched out piece of fabric shaped like the model of the back (102) of the shirt;

0031 at least two stiff templates for the sleeves (122) having substantially the shape of the “open” sleeves (103) of the shirt, said templates (122) being adapted to contain, hold and transport a stretched out piece of fabric shaped like the model of the “open” right and left sleeves (103) of the shirt;

0032 at least two stiff counter-templates (123) having a shape complementary to the curvature (127) of the stiff templates of the sleeves (122);

0033 at least one hollow punch for the chest (124) having a shearing outline adapted to obtain from a fabric, stretched out on the stiff template of the chest (120), a piece of fabric having the shape of the model of the chest (101);

0034 at least one hollow punch for the back (125) having a shearing outline adapted to obtain from a fabric, stretched out on the stiff template of the back (121), a piece of fabric having the shape of the model of the back (102);

0035 at least one hollow punch for the sleeve (126) having a shearing outline adapted to obtain from a fabric, stretched out on the stiff template of the sleeves (122) and adjacent counter-template (123), a piece of fabric having the shape of the model of the “open” sleeves (103);

0036 wherein

0037 the stiff templates of the chest and the back (120) and (121) are slightly larger with respect to the dimensions of the corresponding hollow punches (124) and (125);

0038 the stiff templates (122) of the sleeves are larger with respect to the corresponding hollow punches (126) at the ends of the sleeves and on the side edges, while they are smaller than the corresponding punches at the curvature (127), which will be assembled with chest and back;

0039 each stiff template (122) of the sleeves consists of two semi-templates that are symmetrical with respect to the line of symmetry (128), which are mechanically restrained to each other and can be superimposed by overturning (or closing like a book);

0040 at each curvature (129), which will be assembled with the sleeves, the stiff templates (120) and (121) of the chest and of the back have a movable portion (130) adapted to retract by a distance no greater than the thickness of the stiff template.

0041 The stiff templates (120)-(122) and the counter-templates (123) are made of a stiff material able to resist shearing by means of hollow punches, preferably may consist of a thermoplastic laminate such as, for example, polyoxymethylene (known on the market as DERLIN® or ARNITE®).

0042 The stiff templates (120)-(122) and the counter-templates (123) have the same thickness, preferably ranging between 3 and 20 mm.

0043 All the stiff templates (120)-(122) have, on the upper surfaces (the ones supporting the fabric) and on the side surfaces (131) and (132), at the curvatures of the sleeves (127) and (129), a system for retaining a fabric to said surfaces; said retaining system can preferably consist of a rough covering or be obtained by means of air suction. In the case of the rough covering, a preferred embodiment consists of stiff templates of the chest (120), back (121), and of the sleeves (122), at least partially covered with sheets of fine glass paper. In this embodiment, the glass paper will be arranged on the upper
surfaces of the stiff templates, paying attention not to arrange it on movable portions (130) of the stiff templates of the chest (121) and of the back (122). The glass paper is arranged within the central portion of the upper surface of each stiff template so as to be at least 1 mm away from the corresponding hollow punch when the latter is caused to fall onto the corresponding stiff template.

[0044] The said rough covering must be such as not to alter the continuity of the fabric of which the T-shirt is composed, while nevertheless guaranteeing the perfect retention of the fabric on the stiff templates.

[0045] The counter-templates do not have the fabric retention system in any portion of their surface.

[0046] On their lower surface, the stiff templates have mechanical frames of reference able to keep said templates on pallets.

[0047] Where the sides are in contact with the sleeves (i.e. under the armpits), the stiff templates (120) and (121) of the chest and back have mechanical frames of reference (133) complementary in shape to corresponding mechanical frames of reference (134) present in the stiff templates of the sleeves (122) at the point of contact between sleeves and sides (under the armpits) so as to guarantee and always-precise assembly of the sleeves with the chest/back (see FIG. 2).

[0048] The mechanical frames of reference (134), present in the stiff templates of the sleeves (122) also serve as a bed for the stiff counter-templates (123) when they are adjacent to the stiff templates (122) before and during the punching step (see FIG. 7).

[0049] The movable portions (130) are engaged on the respective templates of the chest and back (120) and (121) with the use of mini-guides which allow the retraction and/or advancement movement by actuable sliding, for example, by means of external manipulators. The movable portions are presented in an initial advanced (i.e. non-retracted) position, and yet are retracted after the punching (see FIG. 2). The initial advanced position of the movable portions (130) in the punching step offers the hollow punches for the chest and back (124) and (125) planar support surfaces for all their shearing outlines, thus guaranteeing the correct shearing of the fabric according to the model of the pre-arranged chest (101) and back (102) (see FIG. 4).

Following punching of the movable portion (130), it is retracted, causing the strip of the fabric which was lying there to fall onto the side surface (132). This fall of fabric, or folding of fabric, will hereinafter be referred to as a “curl” (135) and, as described below, is fundamental to the assembly of the sleeves on the chest/back (see FIG. 5). The strips of fabric which characterise the curls (135) are made to adhere well and well stretched out on the side surface (132) of the movable portions (130), which may be achieved by means of a roller. An appropriate set of stiff templates and corresponding hollow punches and counter-templates will be required for each different model or different size of T-shirt.

[0050] For the automated production of shirts, the set of templates and counter-templates is arranged on top of a set of pallets wherein are pre-arranged appropriate reference pegs and to secure the position of the templates and counter-templates on the respective pallets. In particular, each stiff templates of the sleeves and respective counter-templates must be positioned for punching on top of a said pallet (141), said pallet having guides or tracks which, by means of external manipulators (for example pneumatic ones), enable the displacement of the counter-template (123) from an initial position adjacent to the respective stiff templates (122) to a post-punching position at a distance from the respective stiff templates. The initial position offers for punching of the sleeves (126) a planar supporting surface for the whole of the shearing outline, thus guaranteeing the correct shearing of the fabric according to the pre-arranged model of the open sleeves (103) (see FIG. 8). Following punching, by distancing the counter-templates (123) from the respective templates (122), it happens that the strip of fabric that was lying on the counter-templates (123) falls vertically by resting against the side surface (131) of the stiff templates (122). This fall of the strip of fabric is hereinafter referred to as “curl” (136) and is fundamental, as described in what follows, for the assembly of the sleeves (103) onto the chest/back (101/102) (see FIG. 9). The strips of fabric which characterise the curls (136) must be made to adhere well and well stretched on the external edge (131) of the templates (122), this can be achieved by means of a roller.

[0051] During the punching step, the various templates and counter-templates can be positioned on pallets in an arrangement suitably devised to minimise wastage of the fabric. Following punching, the templates may be displaced, by means of manipulators, onto other pallets with appropriate arrangements for optimising the movements thereof that are necessary for the subsequent elaboration steps.

[0052] In a preferred embodiment, following punching, the stiff templates of chest and back (120) and (121) if are arranged brought alongside relative to a side on top of a single pallet (140). This arrangement (see FIG. 3) allows the aesthetic stitching (110), (111) and (137) to be carried out in a simplified manner and also simplifies the superimposition of one templates onto another with a simple overturning movement analogous to closing a book. In this preferred embodiment, the stiff templates thereof of chest and back (120) and (121) are united along one side by means of a mechanical constraint which allows rotation along the axis (143), for example a hinge (FIGS. 3 and 6).

[0053] The present invention also relates to a process for the, preferably completely automated, production of T-shirts, said process comprising the use of at least one set of stiff templates and corresponding punches and counter-templates as described above; said process wherein chest and back of the shirt are joined by gluing with a suitable adhesive means, just as the sleeves are joined at the chest and back by gluing with a suitable adhesive means.

[0054] According to a preferred embodiment, the present process comprises,

[0055] arranging the set of stiff templates (120)-(122) and counter-templates on a set of pallets; said arrangement provides that each stiff template (122) of the sleeves is arranged on a pallet (141) together with the corresponding counter-template (123) and the initial position of the counter-template (123) is adjacent to the corresponding stiff template (122); the initial position of the movable portions (130) of the stiff templates (120) and (121) of chest and back is not retracted;

[0056] placing a bolt of fabric (142), wrong side up, onto at least one set of stiff templates and counter-templates as described above; preferably said placement occurs in such a way that the fabric adheres to the stiff templates (120), (121), and (122) and counter-templates (123) in a well stretched out manner and without forming folds for example, by means of a roller or by means of an air jet);
cutting the fabric (see FIGS. 4 and 8) on the stiff templates by means of corresponding hollow punches (124), (125) and (126);

retracting the movable portions (130) of the stiff templates of the chest and of the back (120) and (121) and distanc- ing the counter-templates (123) from the stiff templates (122) of the sleeves to obtain the curls (135) and (136);

distributing an adhesive means (see FIGS. 5 and 9) on the side edges (143) and (144) and on the upper edges (145) and (146) of the chest (101) and back (102) and of the side edges (147) of the sleeves and on the curls (135) and (136);

superimposing (see FIG. 6) the stiff template (120) on the stiff template (121), or vice versa, to obtain the chest/back template sandwich (138) and to obtain the formation of the body (101+102) of the T-shirt by means of gluing (152) and (151) the side edges (143) to the side edges (144) and the upper edges (145) to the upper edges (146), respectively, and superimposing (see FIG. 10) the symmetrical semi-templates of the stiff templates of the sleeves (122), to obtain the sleeves template sandwiches (139) and to obtain the formation of the tubes of the sleeves (103) by means of gluing (153) the side edges (147) of a sleeve to each other;

coupling (see FIG. 11) the chest/back templates sandwich (138) with the sleeves template sandwiches (139) to obtain the gluing (154) of the curls (135) to the curls (136);

Optionally and preferably, after punching and before gluing, aesthetic hemnings (110), (113) and (111) can be performed of the lower edges and of the rounded edges, at the collar, chest (101) and back (102) and at the end edges of the sleeves (103); At this point the T-shirt has been completely made up, wrong side up.

After turning the right way out, a T-shirt (150) (see FIG. 12) is obtained, comprising:

The T-shirt obtained by the process according to the present invention is devoid of needle-and-thread stitching at the shoulders, at the sides and at the cuff, and in their place has the gluing (151), (152), (153) and (154). The collar is composed, not of a bolt of fabric stitched on the chest and back but, preferably, of a needle-and-thread hem at the edges of the hole for the head to pass through.

The fabric for production of shirts with the process described above may be of natural or artificial fibre.

At the start of the production process, the fabric is presented on reels of appropriate and standardised measurements in the diameter of the core (“bolt”), having a variable diameter and width ranging between 20 cm and 200 cm. The system according to the invention preferably comprises a reel charger having a capacity of 10 reels with an automatic “feeding” system at the moment of the reel change. After having loaded the material at the start of the day, the method according to the invention comprises automatic cutting with punches, with a system of dragging of the fabric, also automatic, to obtain the two parts of the body (front part (101) and posterior part (102) in two distinct pieces), and the two “open” sleeves (103). From the measurement of the reel and through an optimal arrangement of the stiff templates beneath the fabric it is possible to obtain three adult T-shirts per each cutting step (the quantity is obviously increased for children).

The reel change (necessary when changing the article, or at the end of the fabric) and the change of cutting punches will be facilitated by a “quick-change” system, to enable a size change extremely rapidly.

The method according to the invention comprises an inclined bin for collecting waste, for filling bags ready for collecting rejected fabric.

The movable portions (130) and the counter-templates (123) are movable members which permit dynamism within the zone where it is necessary to form the curl (135) and (136). The starting point of the system is a planar fabric, the famed starter unwinding reel. These minor kinematics enable punching directly on the pallet, and “disappearance” at the appropriate time when the functional curl is created on gluing of the sleeves to the body of the shirt.

The needle-and-thread aesthetic hemnings (110), (111) and (137), linear or curvilinear in the case of the collar, are performed using known automatic sewing machines (for example planar or curved hems) possibly suitably modified to carry out the sewing directly on the pallets.

The gluing is performed by distributing, preferably by means of a standard robot, an adhesive means adapted to gluing strips of fabric. Said adhesive is preferably of the microdots type, for example single-component water-based polyurethane or rubber-based cyanacrylate. An example of a commercially available adhesive adapted to the purposes of the present invention is Henkel LOCTITE®.

Having the pieces of fabric (101) and (102) resident on the stiff templates (120) and (121) renders the chest/back gluing extremely easy, which becomes comparable to gluing of an electronic or plastic components of a motor vehicle. The same applies to the sleeves. Joining of the sleeve templates sandwich (139) to the chest/back templates sandwich (139) by means of precision simple mechanical manipulators allows the shirt to be made up.

The pallets are means of transporting the stiff templates (120)-(122) and counter-templates (123), said pallets are preferably aluminium planar surfaces of dimensions sufficient to contain and transport the stiff templates. The stiff templates on the counter-templates are fixed to the respective pallets by means of reference pegs.

The punches too, for simplifying their movement by automatic manipulators, are preferably arranged on pallets.

The surface of the pallets, in contradistinction to those on which the stiff templates lie, is equipped with friction elements which enable movement of the pallets from one station to another of the production process.

The pallets will move from one work station to another by means of transportation systems, such as for example chain conveyors.
Coupling of the sleeve template sandwiches (139) to the chest/back template sandwich (138) occurs by means of robots or similar systems such as, for example, electrical or pneumatic cartesian robots.

The method according to the invention further provides for conventional and known steps of affixing stamp, label, logo or print or affixing a sweat guard. Stamp and label may be applied simultaneously with or sequentially to the aesthetic hemming of the collar (139). The sweat guard may be applied by gluing of a strip of fabric onto the aesthetic hem of the collar on the back (102). Logo and printing of the chest and/or back of the T-shirt will be performed before the gluing step, i.e. before formation of the body.

The step in which the parts which comprise the body are separated and arranged on the stiff templates, which constitute an in-line flat working surface, is the optimum situation for performing printing of the logo and label of the producer in the collar region.

This can be done using a variety of techniques, multi-colour tamography, screen printing, laser marking (numbers and barcodes), at this point the decision most adapted to the product to be marketed will be taken with the client. Advantageously, in this step it is possible to avail oneself a very printing system to apply a tracking system to the T-shirt (SKU, EAN, QR etc... ) to guarantee the trackability of the product as far as the shelves in the shop. The same code could be used in successive steps of the line such as packaging to guarantee the correct box-product pairing.

Regarding the application of a sweat guard, if desired, it is preferable to use a roll of fabric of suitable size which will be cut to a suitable length to be glued on the stitching of the collar to guarantee the ascetic finish, as well as to provide comfort when wearing.

After the assembly of the sleeves to the body, the T-shirt is turned inside out; therefore, before beginning the finishing and packaging operations, it is necessary to reverse it. Technical solutions for the reversal of garments are known (for example stockings in the production of PVC boots), therefore the same solution or a similar one can be used to turn the shirt.

Once the shirts have been turned, they can be individually pressed. They can then be stacked using an automatic system (for example 12 items laid flat, one on top of the other). By automatic means, the shirts package can be filled in twos and box, all automatically using known systems.

Indeed, via a belt conveyor system the pack of shirts may be fed into an automatic angular packaging machine, which will form the packs.

The types of pack that apply are many, it will be possible to select the most suitable type. In this step, it is also possible to automatically apply a tracking label to the pack before it is inserted into the box.

The packs obtained at the outlet of the packaging machine may, by means of a pick&amp;place manipulator, be inserted into suitable boxes of unified shape, that have been formed by an automatic box-making machine.

Once completed, the box containing the appropriate number of packs, a box closer and taping machine can provide for closure of the top edges and, by means of motorised rollers, can convey the finished box to the palletisation area. In this step also, following closure of the box it is possible to include a tracking label applicator.

1. A set of elements comprising stiff templates for the chest, for the back and for the sleeves, counter-templates for the sleeves and corresponding hollow punches for cutting a fabric in the shape of a chest, back and sleeves, said set of elements specifically prepared to form a T-shirt.

2. A set of elements prepared to form a T-shirt, comprising: at least one stiff chest template shaped substantially like the chest of the T-shirt, said chest template being adapted to contain, hold and transport a stretched out piece of fabric shaped like the model of the chest of the T-shirt; at least one stiff back template shaped substantially like the back of the T-shirt, said back template adapted to contain, hold and transport a stretched out piece of fabric shaped like the model of the back of the T-shirt; at least two stiff sleeve templates shaped substantially like the open sleeves of the T-shirt, said sleeve templates adapted to contain, hold and transport a stretched out piece of fabric shaped like the model of the open right and left sleeves of the T-shirt, respectively; at least two stiff sleeve counter-templates shaped complementary to the curvature of the stiff sleeve templates; at least one hollow chest punch having a shearing outline adapted to obtain, from a fabric, stretched out on the stiff chest template, a piece of fabric shaped like the model of the chest; at least one hollow back punch having a shearing outline adapted to obtain, from a fabric, stretched out on the stiff back template, a piece of fabric shaped like the model of the back; at least one hollow sleeve punch having a shearing outline adapted to obtain, from a fabric, stretched out on the stiff sleeve template and adjacent sleeve counter-template, a piece of fabric shaped like the model of the open sleeves; wherein the stiff chest template and back template are slightly larger with respect to the dimensions of the corresponding hollow chest punch and back punch; the stiff sleeve templates are slightly larger with respect to the corresponding hollow sleeve punch at the ends of the sleeves and of the side edges, while they are slightly smaller than the corresponding sleeve punches at the curvature, which will be assembled with chest and back; each stiff sleeve template consists of two semi-templates that are symmetrical with respect to the line of symmetry, which are mechanically restrained to each other and can be overlapped by overturning (or closing like a book); at each curvature, which will be assembled with the sleeves, the stiff chest template and back template each have a movable portion adapted to retract by a distance no greater than the thickness of the respective stiff chest template and back template.

3. The set of elements according to claim 1, wherein the stiff templates and the counter-templates are made of a stiff material able to resist the shearing by means of hollow punches, preferably may consist of a thermoplastic laminate such as for example polyoxymethylene.

4. The set of elements according to claim 1, wherein the stiff templates and the counter-templates have the same thickness, preferably ranging between 3 and 20 mm.

5. The set of elements according to claim 1, wherein the stiff templates have, on the upper surfaces, the ones supporting the fabric, and on the side surfaces, at the curvatures of the sleeves, a system for retaining a fabric to said surfaces; said retaining system preferably consists of a rough covering or is obtained by means of air suction.
6. The set of elements according to claim 1, wherein the stiff templates and counter-templates are planar.

7. A process comprising the use of at least one set of stiff templates and corresponding hollow punches and counter-templates according to claim 1, said process for obtaining the production, preferably completely automated, of T-shirts; said process wherein chest and back of the T-shirt are joined to each other by gluing with a suitable adhesive means so that the sleeves are joined to the chest and back by gluing with suitable adhesive means.

8. The process according to claim 6, comprising: arranging the set of stiff templates and counter-templates on a set of pallets; said arrangement provides that each stiff template of the sleeves is arranged on a pallet together with the corresponding counter-template and the initial position of the counter-template is adjacent to the corresponding stiff template; the initial position of the movable portions of the stiff templates of chest and back is not retracted;

placing a bolt of fabric, wrong side up, onto at least one set of stiff templates and counter-templates as described above; preferably said placement occurs in such a way that the fabric adheres to the stiff templates and counter-templates in a well stretched out manner and without forming folds (for example, by means of a roller or by means of an air jet);

cutting the fabric on the stiff templates by means of corresponding hollow punches;

retracting the movable portions of the stiff templates of the chest and of the back and separating the counter-templates from the stiff templates of the sleeves to obtain first and second curls;

distributing an adhesive means on the side edges and on the upper edges of the chest and back and of the side edges of the sleeves and on the first and second curls;

superimposing the stiff template of the chest on the stiff template of the back, or vice versa, to obtain the chest/back template sandwich and to obtain the formation of the body of the T-shirt by means of gluing the side edges with the side edges and of the upper edges of the chest with the upper edges of the back, respectively, and superimposing the symmetrical semi-templates of the stiff templates of the sleeves, to obtain the sleeves template sandwiches and to obtain the formation of the tubes of the sleeves by means of gluing the side edges of a same sleeve to each other;

coupling the chest/back templates sandwich with the sleeves template sandwiches to obtain the gluing of the first curls with the second curls.

9. The process according to claim 7, wherein said adhesive means is of microdots type, for example single-component water-based polyurethane or rubber-based cyanacrylate.

10. The process according to claim 7, wherein, after the cutting of the fabric, aesthetic hemming are performed of the lower edges and of the rounded edges, at the collar, chest and back and of the end edges of the sleeves.

11. The process according to claim 7, also comprising typical and known steps of affixing stamp, label, logo or print or affixing a sweat guard.

12. A T-shirt, obtained from the process according to claim 7, said T-shirt comprising:

  - gluing, between chest and back to the shoulders and sides, respectively;
  - gluing, to the sleeves and between the sleeves and the chest and the back respectively.

13. The T-shirt according to claim 12, also comprising needle-and-thread aesthetic hemming of the edges of the hole for the head to pass through;

needle-and-thread aesthetic hemming at the end edges of the sleeves and of the chest and back.