

SPECIFICATION

A Method for Forming Crinkles in Cloth for a Garment and
a Garment

Field of the Invention

This invention relates to a method for forming crinkles in cloth for a garment and garment.

Background Art

One of conventionally known methods for forming crinkles in cloth for a garment is a traditional tie dyeing method wherein the cloth is tied up with threads and so called "dappled cloth" is obtained. Pleating method is also known as another method for forming crinkles in cloth for a garment.

In a generally known pleating method, pleats are formed in cloth before it is formed in a garment, and then the pleated cloth is cut and the garment is sewn. However, when the pleated cloth is sewn to a garment, it is necessary for an operator to sew the cloth while he is pressing the pleats. Thus, there are disadvantages that sewing operation is troublesome and that sewing with a sewing machine is difficult since folded cloth is sewn.

In order to obviate such disadvantages, proposed is a method wherein cloth sewn in a shape of garment is subjected to the pleating operation (for example, Japanese Patent Publication No. Sho 56-9561 and No. Hei 4-23026).

However, since pleats are forcedly formed by a machine in the conventional pleating, the shape of the thus formed pleats is in a regular straight line condition. Further, since the pleats are necessarily regular shape, possible variation is poor from a design point of view.

In order to vary pleats, for example Japanese Patent No. 2504931 discloses that a garment or a garment in a half finished goods is wrapped with a flexible sheet and is twisted, and that after it is tied with a cord, it is put in a heat treating device so as to form pleats. Although thus obtained pleats are not in a completely straight condition which has been common for conventional pleats, only wrinkles in an oblique condition are formed since they are formed by twisting. Variation is still poor. Further, according to this method, it is impossible to form pleats at desired portions in a garment, and thus, variation in design is limited.

Differing from the conventional pleating, proposed is a method wherein a heat-shrinkable and water-soluble thread is used to form plaits or wrinkles. Japanese Patent Application Laid-open No. Hei 8-218213 or No. Hei 9-87963 discloses that desired portions in a garment made of a thermoplastic material are tacked with a heat-shrinkable and water-soluble thread and are heated to shrink the heat-shrinkable and water-soluble thread to form plaits, and then, the heat-shrinkable and water-soluble thread is solved and removed with warm water so that plaits are formed on the desired positions on the garment.

Japanese Patent Application Laid-open No. Hei 9-31839 discloses that a water-soluble thread having shrinkable property and a non-shrinkable thread are interwoven, and the shrinkable and water-soluble thread is shrunk, and then, the water-soluble thread is solved and removed so as to form wrinkles in the cloth.

When crinkles are formed in cloth in accordance with the conventional tie dyeing method, there are advantages that the crinkles can be formed at any desired portions in the garment and that the shape of the crinkles can be formed at will. However, this method has disadvantages that operation is very time consuming since a thread has to be wound around each portion in the cloth where a crinkle or a projection is desired to be formed, and that accordingly, the garment thus formed becomes very expensive.

Contrary to this, according to a pleating method wherein folds are mechanically formed as it is common in the conventional pleating methods, there is a disadvantage that design variation is poor. In addition, the cloth can be expanded and contracted in a direction perpendicular to the folds but cannot be expanded or contracted in a direction of the folds. Consequently, even when pleats are formed in entire portions of a garment, the direction wherein the garment can be expanded and contracted is limited to a direction perpendicular to the creases. In other words, the thus obtained garment is somewhat different from knitted fabric, which can expand and contract in both the weft and warp directions, and it is difficult to fit any persons who may have various body shapes.

If stitches are sewn at predetermined portions of a garment with a heat-shrinkable and water-soluble thread so as to form crinkles as disclosed in Japanese Patent Application Laid-open No. Hei 8-218213 or No. Hei 9-87963, the portions of the garment cannot be fully contracted due to the force created by the cloth since the contraction is done only by the thread. Accordingly, only a small amount of wrinkles can be formed. Further, this method cannot be applicable to a thick cloth. Thus, according to this method, wrinkles only with very small projections and recesses can be obtained.

Further, as described above, since only very small projections and recesses are obtained as an uneven surface according to this method, variation can not be expected from a design point of view.

When a water-soluble thread having shrinkable property is interwoven as disclosed in Japanese Patent Application Laid-open No. Hei 9-31839, there is a problem that the kinds of cloth are limited, and also there is a disadvantage that a shrinkable thread can be only woven straight along the weft or warp direction since it is interwoven. In other words, any desired cloth cannot be used for this method, and contracting portions

cannot be set at will, and thus it is very difficult to vary its design.

It is an object of the present invention to provide a method for forming crinkles in cloth for a garment by which crinkles can be formed at almost entire portions of the garment or any desired portion of the garment without any substantial limitation from a design point of view. Further, since crinkles are formed at entire portions of the garment or any desired portion of the garment, the present invention provides a method for forming a garment having crinkles which can expand and contract in both the length and breadth directions like a knitted fabric.

It is another object of the present invention to provide a method by which crinkles can be formed in cloth for a garment and by which the surface of the cloth for the garment can be varied.

It is still other object of the present invention to provide a method by which clear ridges or grooves like rib-stitch or thick and big ridges and grooves like cable-stitch can be formed in cloth, or by which clear ridges and grooves can be formed in a thick cloth. Further, the present invention provides a garment which has such clear ridges and grooves in the cloth thereof.

Description of the Invention

According to the present invention, the first described object is achieved by a method for forming crinkles in cloth for a garment comprising:

- cutting cloth including thermoplastic fiber into parts of the garment;

- sewing the parts into a shape of the garment;

- overlaying the garment on a thermo-shrinkable cloth and sewing them together with stitches of a water-soluble thread;

- heating the sewn cloths by means of heating means under

dry heat and without applying any pressure to the cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles in the cloth of the garment; and

solving and removing the water-soluble thread so as to separate the cloth of the garment from the thermo-shrinkable cloth.

According to the present invention, the first object is also achieved by:

partially laying at least one piece of thermo-shrinkable cloth on a garment made of cloth including thermoplastic fiber;

sewing the thermo-shrinkable cloth and the garment with stitches of a water-soluble thread;

heating the sewn cloths by means of heating means under dry heat and without applying any pressure to the cloths so as to permit the thermo-shrinkable cloth to shrink; and

solving and removing the water-soluble thread so as to separate the cloth of the garment from the thermo-shrinkable cloth whereby crinkles and gathers are formed in the cloth of the garment.

Further, the above-described first and second objects are achieved by:

shrinking the thermo-shrinkable cloth so as to form crinkles in the cloth of the garment;

solving and removing the water-soluble thread so as to separate the cloth of the garment from the thermo-shrinkable cloth; and

before or after solving and removing the water-soluble thread, subjecting the cloth of the garment to sublimation transfer printing.

Furthermore, according to the present invention, the above-described first and second objects are achieved by:

shrinking the thermo-shrinkable cloth so as to form crinkles in the cloth of the garment;

solving and removing the water-soluble thread so as to separate the cloth of the garment from the thermo-shrinkable

cloth; and

thereafter, adhering a sheet-like material to the cloth of garment.

According to the present invention, the above-described first and third objects are also achieved by:

in a step for overlaying cloth including thermoplastic fiber on a shrinkable cloth and sewing them together with stitches of a water-soluble thread, after sewing them together with first stitches, sewing the sewn cloths with second stitches of a water-soluble thread parallel to the first stitches in such a manner that the sewn cloths are picked up and tucked at the first stitches.

It is preferred that the tucked width upon making tucks in the stitched cloths is between 1 to 20 mm. In addition, when the picking up is alternately performed from the front side and the back side of the stitched cloths upon making tucks in the sewn cloths, clear ridges and grooves like rib-stitch can be obtained.

It is also preferred that upon picking up and tucking the sewn cloths, three rows of first stitches make a set, each row of first stitches locating at the center of the tuck upon picking up the stitched cloths and the distance between adjacent rows of the first stitches being between 10 and 20 mm, that the sewn cloths are picked up at the first stitches locating at the center of the set by a wide picking up width toward the cloth including the thermoplastic fiber and are tucked with the second stitches of the water-soluble thread, that the sewn cloths are picked up at the rows of the first stitches locating at both sides of the set by a narrow picking up width toward the thermo-shrinkable cloth and are tucked up with the second stitches of the water-soluble thread, and that the stitched cloths are heated and the water-soluble threads are removed whereby a big projection is formed in the cloths including the thermoplastic fiber as a result of cooperation of the set of the three rows of first stitches and the second stitches forming three tucks at the three

rows of first stitches.

Another aspect of the present invention is characterized in that after the cloth including the thermoplastic fiber and thermo-shrinkable cloth are overlaid and sewn together with the stitches of the water-soluble threads, the thermo-shrinkable cloth is cut at least at one position between the adjacent rows of stitches, and thereafter, the sewn cloths are heated. The cut edges of the heat-shrinkable cloth shrink freely regardless of existence of the cloth including thermoplastic fiber around the portions, and accordingly, gathers are formed in the cloth including thermoplastic fiber locating between the stitches. Thus, the above-described first and third objects are also achieved by the present invention of this aspect.

In the cloth or garment made according to one of methods of the present invention, more specifically, the method wherein after sewing the cloths together with first stitches, the sewn cloths are sewn with second stitches of a water-soluble thread parallel to the first stitches in such a manner that the sewn cloths are picked up and tucked at the first stitches, thereafter, the sewn cloths are heated, and water-soluble threads are solved and removed, the cloth has ridges or grooves, each of which has a first series of needle holes extending in a longitudinal direction thereof at the top of the ridge or the bottom of the groove and each of which has two second series of needle holes extending in a longitudinal direction thereof and parallel to the first series of needle holes at both sides of the first series of needle holes, the second series of needle holes locate at the base portion or intermediate portion of the ridge or groove, and the ridge or groove has small pleats or crinkles formed thereon. Thus, the above-described third object is also achieved.

Brief Description of the Drawings

The present invention will now be explained in detail with reference to the accompanying drawings, wherein:

Fig. 1(a) to Fig. 1(c) are plan views diagrammatically explaining the steps for manufacturing a garment according to the present invention;

Fig. 2 is a schematic view in an enlarged scale than Fig. 1 for explaining the condition wherein the cloth for the garment and the heat-shrinkable cloth are sewn together with a water-soluble thread, wherein Fig. 2(a) is a plan view wherein a plurality of rows of stitches are formed on the straight and in parallel, Fig. 2(b) is a cross sectional view taken along line B-B in Fig. 2(a), Fig. 2(c) is a plan view of the cloth having crinkles formed therein, Fig. 2(d) is a cross sectional view taken along line D-D in Fig. 2(c), and Fig. 2(e) is a cross sectional view taken along line E-E in Fig. 2(c);

Fig. 3 is a schematic view similar to Fig. 2, wherein Fig. 3(a) is a plan view wherein a plurality of rows of stitches are horizontally formed in parallel and along a curve, and Fig. 3(b) is a plan view of the cloth which has obtained by thermally shrinking one illustrated in Fig. 3(a) to form crinkles;

Fig. 4(a) and Fig. 4(b) are perspective views showing other methods for forming stitches according to the present invention;

Fig. 5 is a view showing an embodiment for forming stitches, wherein Fig. 5(a) is a plan view, Fig. 5(b) is a cross sectional view taken along line B-B in Fig. 5(a), and Fig. 5(c) is a plan view of the cloth for a garment after heat treatment;

Fig. 6 shows another embodiment of the method according to the present invention, wherein Fig. 6(a) is a plan view of the cloths before heat treatment, Fig. 6(b) is a cross sectional view of the cloths before heat treatment, and Fig. 6(c) is a plan view of the cloth for a garment after heat treatment;

Fig. 7 shows a still other embodiment of the method according to the present invention, wherein Fig. 7(a) is a plan view of the cloths before heat treatment, and Fig. 7(b) is a plan view of the cloth for a garment after heat treatment;

Fig. 8 shows the other embodiment of the method according to the present invention, and Fig. 8(a) to Fig. 8(c) are cross sectional views of the cloths;

Fig. 9 shows another embodiment of the method according

to the present invention, wherein Fig. 9(a) is a plan view of the obtained garment, and Fig. 9(b) is a cross sectional view of the cloths used for the front body part of the garment;

Fig. 10 shows steps for forming ridges and grooves like rib-stitch, wherein Fig. 10(a) is a plan view of the sewn cloth, Fig. 10(b) is an enlarged perspective view showing the sewing method, Fig. 10(c) is a plan view schematically showing the rib-stitch like pattern in the cloth for the obtained garment, Fig. 10(d) is a cross sectional view schematically showing the rib-stitch like pattern in the cloth for the obtained garment;

Fig. 11 shows another embodiment of the present invention, wherein Fig. 11(a) is a plan view showing the manufactured garment, and Fig. 11(b) is a view of the pattern for forming the front body part of the garment illustrated in Fig. 11(a);

Fig. 12 is an enlarged view showing the method for sewing the cross stripes of the garment illustrated in Fig. 11, wherein Fig. 12(a) is a plan view, and Fig. 12(b) is a view taken along the cross section and showing the sewing method;

Fig. 13 shows another embodiment of the present invention, wherein Fig. 13(a) is a plan view of the garment manufactured according to the present invention, and Fig. 13(b) is a pattern view for forming the front body part of the garment illustrated in Fig. 13(a);

Figs. 14 (a) and (b) are plan views for explaining the stitching method for forming the cable-stitch pattern such as illustrated in Fig. 13(a), and Fig. 14(c) is a view taken along the cross section and showing the sewing method;

Fig. 15 shows a still other embodiment of the present invention, wherein Fig. 15(a) is a cross sectional view of cloths showing the sewing method, Fig. 15(b) is a plan view of the sewn cloths, Fig. 15(c) is a cross sectional view at the pattern portion in the obtained cloth, and Fig. 15(d) is an enlarged plan view at the pattern portion in the obtained cloth;

Fig. 16 shows the other embodiment of the present invention, wherein Fig. 16(a) is a plan view of the obtained skirt, Fig. 16(b) shows pattern to be transferred to the cloth of Tevicon cloth, and Fig. 16(b) is a view showing the sewing

method; and

Fig. 17 shows another embodiment, wherein Fig. 17(a) is a plan view of the finished article, Fig. 17(b) is a plan view of the stitches, Fig. 17(c) is a view taken along the cross section and showing the sewing method, and Fig. 17(d) is a schematic view of the pattern.

Best Mode for Carrying out the Invention

The present invention will now be explained in detail with reference to the accompanying drawings. Fig. 1(a) to Fig. 1(c) are plan views diagrammatically explaining the steps for manufacturing a garment according to the present invention. First, a cloth including thermoplastic fiber is cut into parts of the garment, and the parts are sewn in a shape of the garment as illustrated in Fig. 1(a). The thermoplastic fiber is not especially limited as long as it is possible to be heat set, and among them, polyester fiber is preferable. From a heat set point of view, cloth including thermoplastic fiber more than 50 % has to be used, and it is preferred to use cloth including thermoplastic fiber between 70 and 100 %.

Since the garment manufactured by the method according to the present invention finally has crinkles formed in the cloth thereof, and the size of the finished garment will be contracted by 10 to 65 % from the material cloth, taking the contraction into consideration, the cloth has to be cut in a larger shape, i.e., 1.1 to 2.8 times as large as the finished size, when the cloth is cut into parts, and then the parts are sewn into a shape of the garment. The above-described "shape of the garment" may be a shape of a complete garment wherein all the parts are sewn or a shape of a particular portion of a garment (for example, a body part in a garment with sleeves). When the parts are sewn into the shape of the particular portion of the garment at this stage, after the method of the present invention which will now be explained is carried out to the particular portion, the particular portion may be sewn with the remaining parts to complete the garment.

Then, the garment formed by the cloth 1 is overlaid on a thermo-shrinkable cloth 2, for which "Teviron" (Registered Trademark) cloth, cloth made of polyvinyl chloride and manufactured by Teijin Ltd. is used in the embodiment, and they are sewn by means of a sewing machine with stitches of water-soluble thread 3 (see Fig. 1 (b)). The water-soluble thread 3 may be, for example, "Solvron" (Registered Trademark) manufactured by Kabushiki-Kaisha Nitivy.

The stitches can be sewn in any directions and patterns at will by means of a sewing machine, and thus, any desired design can be realized. In the embodiment illustrated in Fig. 1(b), for example, a plurality of parallel and vertical rows of stitches 31 are formed at the neck portion, breast portion and the waist portion, rows of stitches 32, each forming an arc along a neckline, formed around the neckline, rows of stitches 33 forming arcs at both side portions, horizontal rows of stitches 34 at the breast portions and oblique stitches 35 at the bottom portion, and thus, whole the cloth 1 of the garment is sewn with the thermo-shrinkable cloth 2. The distance between the adjacent rows of the stitches 31, 32, 33, 34, or 35 may be optionally set. When stitches are formed in the entire portions of the garment as illustrated in Fig. 1(b), though the suitable distance may depend on thickness of the cloth of the garment or the like, the distance between about 6 and 10 mm, for example, is suitable for relatively thin cloth taking the formed crinkles into consideration.

The cloth 1 of the garment and the heat-shrinkable cloth 2 which have been sewn together are heat treated under dry heat so as to permit the thermo-shrinkable cloth 2 to shrink and form crinkles in the cloth 1 of the garment.

The heat-shrinkable cloth 2 used in the present invention has a thermo-shrinkage percentage between 20 and 60 %, preferably at least 30 %, for at least one of the weft and warp directions. The thermo-shrinkable cloth 2 using thermo-shrinkable yarns for

both the weft and warp yarns is preferable since it contracts in both the direction, however, cloth using a thermo-shrinkable yarn for either the weft or warp yarn and capable of being contracted in either one of the weft and warp directions may be used. The thermo-shrinkage percentage may differ in the warp and weft directions. Thread using polyvinyl chloride fiber or polyurethane fiber, such as "SPANDEX" (Trademark), for example, is suitable for the thermo-shrinkable thread.

In order to make the garment have stretchability like knit goods, it is preferred to use thermo-shrinkable cloth 2 having thermo-shrinkage percentage about 50 % in both the weft and warp directions. Tevicon cloth manufactured by Teijin Ltd. and woven with "TEVICON" filament yarns having thickness of between 50 and 100 denier (55 and 110 dtex) for the weft and warp yarns, for example, may be used as the thermo-shrinkable cloth 2.

The heating temperature according to the present invention may be between 140 and 195°C, and the heating time may be between 40 sec and 6 minutes depending on the thickness of the cloths and the sewn patterns. When it is desired to heat for 6 minutes, the heating operation may be divided, for example, into three times, each continues for two minutes. Although the cloths are made of the same material, the time may differ depending on their sizes or the sewn patterns. Further, in case of thick cloth or thickness of the sewn cloth being big due to tucking, the required heating time may vary, and accordingly, it is recommended to appropriately adjust the heating time and temperature through previously performed trial manufacture.

For example, in case that relatively thin cloth is sewn with stitches as illustrated in Fig. 1(b), it is heated for about between 45 and 60 sec by means of the heating plate heated at between 190 and 195°C under dry heat and without applying any pressure to the cloths, the thermo-shrinkable cloth 2 is contracted in both the warp and weft directions.

When the cloth 1 to be a garment of relatively thin and

Teviron cloth which may shrink about 50 % are used, the dimensions in both the warp and weft directions were reduced to about half of the original dimensions after the heating operation. Even after the thermo-shrinkable cloth 2 is contracted and becomes small, the cloth 1 of garment remains its original size, and accordingly, surplus in the cloth 1 is floated at the portions which are not sewn and forms projections, and depressions are made at the portions sewn by the stitches 31, 32, 33, 34 and 35.

Thereafter, the sewn cloths 1 and 2 are dipped in hot water of between 70 and 90 °C so as to solve and remove the water-soluble thread 3, and thus the connection between the cloth 1 of garment and the thermo-shrinkable cloth 2 is dismissed, and then the thermo-shrinkable cloth 2 is peeled off from the cloth 1 of garment. As a result, such a garment as illustrated in Fig. 1(c) which has many crinkles expandable in both the length and breadth is obtained.

As shown in Fig. 1(c), crinkles are formed in such a shape as arcs at the portion near the neckline and the side portions where the rows of stitches 32 and 33 were sewn along arcs, and crinkles form straight lines at the breast portion and the body portion where the rows of stitches 31, 34 and 35 were sewn in straight lines. This phenomenon is caused by the contraction of the thermo-shrinkable cloth in both the warp and weft directions.

Fig. 2 is a schematic view in an enlarged scale than Fig. 1 for explaining the condition wherein the cloth 1 of garment and the heat-shrinkable cloth 2 are sewn together with a water-soluble thread 3 and the condition for forming crinkles in the cloth 1. Fig. 2(a) is a plan view wherein a plurality of rows of stitches are formed on the straight and in parallel, Fig. 2(b) is a cross sectional view taken along line B-B in Fig. 2(a), wherein the thickness of the cloths 1 and 2 is exaggerated from their actual thickness. Fig. 2(c) is a plan view of the cloth 1 having crinkles formed therein, Fig. 2(d) is a cross sectional view

taken along line D-D in Fig. 2(c), and Fig. 2(e) is a cross sectional view taken along line E-E in Fig. 2(c).

As illustrated in Figs. 2(c) and 2(d), crinkles, which comprise projections 1a and depressions 1b forming a straight line, respectively, are formed in the cloth 1. Although the projections 1a and the depressions 1b seems to be regular in Figs. 2(c) and 2(d) (please note that Fig. 2 is schematically illustrated), they are irregular in their actual forms. More specifically, the portions which have been fixed to each other with stitches 3 are contracted together with the thermo-shrinkable cloth 2 and are restricted by the stitches 3, and thus they turn into small wrinkles, and they form continuous depressions 1b as a whole. Contrary to this, since the portions between the adjacent rows of the stitches 3 are not fixed, they are floated great, and thus projections 1a appear discontinuously. Since the projections 1a are discontinuous, they are to be recognized as like projections created by tie dyeing rather than pleats.

Fig. 3 is a schematic view similar to Fig. 2, wherein Fig. 3(a) is a plan view wherein a plurality of rows of stitches are horizontally formed in parallel and along a curve such as neckline portion, and Fig. 3(b) is a plan view of the cloth which has obtained by thermally shrinking such a cloth to form crinkles. As illustrated in Fig. 3(b), the portions where rows of stitches have been sewn along curves form curved continuous depressions 1b, and projections 1a appear discontinuously between the one depression and the adjacent depression and locate along curves.

Fig. 4 is a perspective view showing another method for forming stitches different from the above-described embodiment. The cloth 1 of garment is overlaid on the thermo-shrinkable cloth 2, and under this condition, they are sewn with a water-soluble thread 3 while they are picked up and tucked alternately from the front side and the back side of the stitched cloths like pin-tuck, and thus crinkles like knit fabric of rib-stitch are

formed. According to the present invention, the tucked width upon making tucks in the stitched cloths is appropriately selected between 1 to 20 mm taking into consideration the size of the crinkles to be formed and is not limited to between 1 and 1.5 mm which is common for usual pin-tuck.

In this embodiment, as illustrated in Fig. 4(a), the overlaid cloths 1 and 2 are sewn with stitches 36 of water-soluble thread 3 so as to prevent their mutual displacement. Then, as illustrated in Fig. 4(b), the sewn cloths 1 and 2 are picked up in a tucked manner at the stitches 36, toward, for example, the front side, i.e., toward the opposite side of the thermo-shrinkable cloth 2. In other words, they are picked up along the rows of stitches 36, at the rows of stitches 36 locating at the top of the picked up portion. Stitches 37 are sewn at the base of the picked up portion with a water-soluble thread 3 by means of a sewing machine like pin-tuck. In this specification, the stitches sewn at the base portion of the picked up portion will be referred to as "tuck stitches" hereinbelow. Then, the cloths 1 and 2 are picked up at the adjacent rows of stitches 36 toward the back side, i.e., toward the side of the thermo-shrinkable cloth 2, and tuck stitches 37 are sewn with a water-soluble thread 3 like pin-tuck. Such operations are alternately performed from the front side and the back side, and then, the cloths 1 and 2 are heated so as to shrink the thermo-shrinkable cloth 2, and knit-like garment is obtained after water-soluble threads 3 are solved and removed.

Although the stitches were almost uniformly formed in the entire portions of the garment in the embodiment illustrated in Fig. 1, the stitches may be formed at a part or parts of the garment but not entire portions, and they may be not uniform, i.e., the distance between the rows of stitches may be varied.

A large space may be formed between the portion where the rows of stitches are sewn at narrow distance and the adjacent portion where the rows of stitches are sewn at narrow distance. In order to prevent a portion of the cloth 1 of garment locating

in the large space from being shrunk when the thermo-shrinkable cloth 2 is contracted, the thermo-shrinkable cloth having shape corresponding to the portions to be stitched may be overlaid only on the portions. Alternatively, after a large thermo-shrinkable cloth 2 is overlaid and narrow spaced rows of stitches are sewn, the thermo-shrinkable cloth 2 may be cut at the wide intermediate portion between the narrow spaced rows of stitches and the other narrow spaced rows of stitches. Then, the cloths 1 and 2 are heated so as to shrink the thermo-shrinkable cloth 2. Due to these operations, only the stitched portions of the cloth 1 of garment are contracted with the thermo-shrinkable cloth 2, and the remaining portions of the cloth 1 are not contracted. Thus, portions having crinkles and gather-like portions are formed due to contraction.

For example, Fig. 5 is a view showing an embodiment for carrying out the above-described method, wherein Fig. 5(a) is a plan view, and Fig. 5(b) is a cross sectional view taken along line B-B in Fig. 5(a), and Fig. 5(c) is a plan view of the cloth for a garment after heat treatment. As illustrated in Fig. 5(a), some rows of stitches (two rows of stitches in the embodiment illustrated in Fig. 5(a)), parallel to each other forming small distance therebetween and making a set are sewn along curved lines with water-soluble thread 3 to sew together the cloth 1 of garment and the thermo-shrinkable cloth 2. In the embodiment illustrated in Fig. 5(a), two sets of stitches draw a curved pattern at one portion wherein they are entangled to each other, and the curved pattern is spaced from the adjacent curved pattern. As illustrated in Figs. 5(a) and 5(b), only the thermo-shrinkable cloth 2 between the adjacent sets is cut at portion 21, which is illustrated by a two-dots and line. Under this condition, heating is carried out, and the water-soluble threads 3 are solved and removed, and when the cloth 1 is separated from the cloth 2, crinkles projecting along curves are formed in the cloth 1 of garment, and they form an aesthetic pattern as illustrated in Fig. 5(c). The crinkles in this embodiment are formed by two rows of stitches forming narrow distance therebetween, protrude over the other portions, and form a pin-

tuck like projections.

In place of cutting the thermo-shrinkable cloth 2 at the portion 21, a thermo-shrinkable cloth formed in a tape-like shape having width somewhat wider than the width of the curved pattern may be prepared, and the tape-like thermo-shrinkable cloth may be sewn together with the cloth 1 of garment with a water-soluble thread 3.

Fig. 6 shows another embodiment, wherein Fig. 6(a) is a plan view of the cloths before heat treatment, Fig. 6(b) is a cross sectional view of the cloths before heat treatment, and Fig. 6(c) is a plan view of the cloth for a garment after heat treatment. As illustrated in Fig. 6(b), a thick cotton-like sheet 4 is overlaid over two cloths of garment 1, and a thermo-shrinkable cloth 2 is overlaid thereon. Then, as illustrated in Fig. 6(a), stitches are sewn in an oblique cross stripe pattern with water-soluble threads 3. Thereafter, they are heated, and then, the water-soluble threads 3 are solved and removed. When the cloth 1 is separated from the cloth 2, the obtained cloth 1 has projections 1a creating a diamond shape pattern and depressions 1b at the stitched portion as illustrated in Fig. 6(c). In this embodiment, since the stitches are sewn while the cotton-like sheet 4 is sandwiched between the cloth 1 and the cloth 2, portions in the cloth of garment which are not fixed by the stitches keep the bulked condition due to the cotton-like sheet 4 when the thermo-shrinkable cloth 2 is thermally shrunk by heating. As a result, small crinkles are scarcely created.

Fig. 7 shows a still other embodiment of the method according to the present invention, wherein Fig. 7(a) is a plan view of the cloths before heat treatment, and Fig. 7(b) is a plan view of the cloth for a garment after heat treatment. In this embodiment, in place of stitching after overlaying the thermo-shrinkable cloth 2 over their entire portion of the garment, the thermo-shrinkable cloth 2 is partially overlaid on the cloth 1 of garment as illustrated Fig. 7(a), and stitches are sewn only the overlaid portions with a water-soluble thread 3. They are

subjected to heat treatment so as to shrink the thermo-shrinkable cloth 2, and thereafter, they are rinsed in hot water of between 70 and 90°C so as to remove the water-soluble thread 3. In the cloth 1 thus obtained, as illustrated in Fig. 7(b), small crinkles are formed at the portion where the thermo-shrinkable cloths 2 have been overlaid. Since the portions having no thermo-shrinkable cloths 2 overlaid thereon are subjected to the heat treatment while they are wrinkled together with the crinkles, they are heat set in a gathered condition 1c. According to this embodiment, in one garment, without cutting and sewing the cloth, two kinds of phenomena, i.e., small crinkles 1a and 1b similar to those obtained by tie dyeing and gathers 1c, can be realized. Further, the size and disposition of the thermo-shrinkable cloths 2 and the stitching may be varied optionally, and the design can be variously changed.

In a method further developed from the above-described method, after crinkles are formed in the cloth of garment, before or after the water-soluble thread 3 is solved and removed, the cloth 1 may be subjected to sublimation transfer printing. More specifically, a thermally transfer printing sheet having sublimation dye adhered thereon is placed over the crinkled cloth 1, and sublimation transfer is carried out for about 30 sec at about 180°C so as to effect the printing.

Another developed method will now be explained with reference to Fig. 8. Figs. 8(a) to (c) are cross sectional views of a cloth. Crinkles are formed in the cloth 1 of a garment, and after water-soluble thread is solved and removed, as illustrated in Fig. 8(a), a sheet-like material 5 is adhered to the cloth 1. The sheet-like material 5 is a thin sheet having hot melt adhesive layer 51 formed on one side thereof, and it can be adhered to the cloth 1 by heating. Thereafter, as illustrated in Fig. 8(b), when the cloth 1 having crinkles formed therein is extended together with the thin sheet-like material 5, the thin sheet-like material 5 is broken at several positions. If the expansion is stopped, the cloth 1 contracts again forming crinkles and becomes into such a condition as illustrated in Fig.

8(c). When such a garment is worn on, the gaps between the sheet-like material 5 open and amusing effect can be obtained.

The sheet-like material 5 used in this method is not limited as long as it is relatively easily broken under tension, and thin polyurethane sheet such as used on the surface of artificial leather is preferable since it affect the aesthetic influence of the cloth. An example for such a sheet is "DIMA" (Registered Trademark), a polyurethane sheet used on an artificial leather and manufactured by Komatsu Seiren kabushiki-Kaisha. Using such a sheet, the cloth can have surface of strange feeling since it has skin of an artificial leather thereon, and thus, a garment of remarkably fresh design can be obtained due to the surface together with the crinkles. Further, when a release paper having uneven pattern, such as snake skin pattern, is used as a release paper for the polyurethane sheet, the pattern will also appear on the urethane sheet, and accordingly, the surface of the cloth also has uneven pattern of the release paper and is amusing. Varying the pattern of the release paper, the pattern appearing on the garment which is the final product may be variously changed. Further, since the garment has polyurethane sheet on the cloth thereof, water repellency and property for keeping warm can be obtained.

Fig. 9 shows another more definite embodiment. Fig. 9(a) is a plan view of the obtained garment. As illustrated in Fig. 9(a), this garment has diamond shaped pattern formed at the breast of the front body part, in addition, narrow vertical ridges like rib-stitch also formed at the breast portion designated by reference numeral A, wide pitched vertical ridges like rib-stitch at the portion B near the bottom portion thereof and plaits formed at the bottom portion C. The sleeves also have thin ridges and grooves like rib-stitch similar to the breast A.

Upon manufacture of this garment, cloths 6 to be pattern is previously attached and fixed to the cloth 1 to be the front body part. The cloth 6 preferably has adhesive on one side thereof, such as fusible interlining, and it is thermally fixed

to the cloth of the front body part so as to form pattern. In order to secure fixing, it is preferred that its peripheries are fixed by means of a sewing machine. The pattern cloth 6 is also a cloth made of thermoplastic fiber such as polyester.

In order to form ridges and grooves like rib-stitch, the following operation is carried out. First, as illustrated in Fig. 10(a), the cloths 1 of the front body part 11, the back body part 12 and sleeves are sewn in a shape of garment, and they are overlaid on Tevicon cloth so that Tevicon cloth becomes in contact with the side of the back body part 12. Under this condition, as illustrated in Fig. 10(a), rows of stitches are formed with a water-soluble thread 3 at a predetermined pitch. In an actual embodiment, rows of stitches were made at 10 mm pitch at the portion corresponding to portion A, and rows of stitches were made at 20 mm pitch at the portion corresponding to portion B.

Then, as illustrated in Fig. 10(b), the cloths are picked up at the rows of previously sewn stitches 36 and tuck stitches 37 are sewn with water-soluble threads 3 while they are tucked. In this occasion, the distance between the row of stitches 36 in portion A and the tuck stitch 37, i.e., the tucking width S, is set at 1 mm, and in portion B, the tucking width is set at 5 mm. In this occasion, as illustrated in Fig. 10(b), every other rows of stitches 36 is picked up toward the side of Tevicon cloth and tuck stitches 37 are sewn, and after the cloths are turned over, every other rows of stitches 36 is picked up toward the front side, i.e., toward the front body part, and tuck stitch 37 is sewn. After tuck stitches 37 are sewn as described above, the overlaid cloths 1 and 2 form a zigzag cross section as a whole. Under this condition, they are heated for 70 sec at 140°C and heat set so as to contract the Tevicon cloth. Then, the water-soluble threads, i.e., Solvcon thread, used for the stitches 36 and the stitches 37 are solved, the Tevicon cloth is peeled off from the front body part 11 and the back body part 12 of the garment, thus, the garment as illustrated in Fig. 9(a) was obtained.

Although in the above-described embodiment, the stitches 36 and 37 were sewn after the sleeves had been attached to the body parts, the body parts and the sleeves may be treated separately and they may be combined later. In this embodiment, tuck stitch was sewn at position 1 mm away from the end, which is created by folding along the stitches 36. Stitch sewn at position within 1 to 3 mm from an end is usually called "end stitch", the expression "sew end stitch" in the following embodiment means that the tuck stitch is so sewn that the tucking width is within range of between 1 to 3 mm.

Fig. 10(c) is a plan view schematically showing the rib-stitch like pattern, and Fig. 10(d) is a cross sectional view schematically showing the rib-stitch like pattern. When seen from the side of the front body part, as illustrated in Fig. 10(c), the rib-stitch like pattern has ridge portion 1c wherein crinkles are bulged forming narrow stripe and grooves 1e and 1d alternately formed like rib-stitch. As illustrated in Fig. 10(d), the ridges 1c which has not been in contact with Tevicon cloth are gentle, while the projections, which has been in contact with and sewn with Tevicon cloth and which are grooves when they are seen from the side of the front body part, become sharp. Between the ridges 1c and 1d, there are intermediate crinkled portions 1e. As described above, the crinkles formed by tuck are remarkably clear compared with those formed by a single row of stitches.

As described above, the cloth 1 of garment has ridges or grooves, and although it is not illustrated in Figs. 10(c) and 10(d), the cloth 1 has series of needle holes formed therein as traces of the stitches 36 and 37 sewn with water-soluble threads. More specifically, a series of needle holes extends in a longitudinal direction at the top of a ridge or the bottom of a groove as a trace of the stitches 36. Two series of needle holes extend in a longitudinal direction in parallel with the above-described series of needle holes at both sides of the above-described series of needle holes as a trace of the stitches 37.

The latter series of needle holes locate at the base portion or intermediate portion of the ridge or groove. The ridge or groove formed by the stitches 36 and tuck stitches 37 has small pleats or crinkles formed thereon since the cloth 1 has been heated and contracted while it has been secured to the thermo-shrinkable cloth by means of the stitches 36 and tuck stitches 37.

According to the embodiments illustrated in Figs. 9 and 10, the finished garment has ridges and grooves like rib-stitch as illustrated in Fig. 10(d), and due to formation of the ridges and grooves in a longitudinal direction, the garment contracts great in a widthwise direction. In addition to the shrinkage percentage of the Tevicon cloth, influence due to tuck also appears, and thus, as a whole contraction in the widthwise direction becomes larger than that in the longitudinal direction. Accordingly, upon cutting first, the size in the widthwise direction is set 2.7 to 2.8 times as large as that of the final garment because it contracts great in the widthwise direction. The garment may contract in the longitudinal direction together with the contraction of the Tevicon cloth, the longitudinal size was set about 1.4 times as large as that of the final garment according to this embodiment.

Upon tucking, the cloths may be folded at the stitches 36 which have been sewn previously as the center of tucking and picked up, and stitches 37 may be sewn in an ordinary manner along the folded end by means of a usual sewing machine. However, tuck can be sewn by means of a sewing machine for forming various decorative stitching. In this occasion, in such a sewing machine, two needles forms stitches of needle threads while a bobbin thread is sewn in a zigzag manner between the two needle threads. When the tension in the bobbin thread is raised, the stitches between the two needle threads are brought near to form tuck condition. As described above, using a sewing machine for forming various decorative stitching, tuck can be formed readily. In this occasion, the sewing machine for forming various decorative stitching sews stitches in such manner that the stitches 36 for the center of tucking which have been sewn

previously locate between the two rows of stitches.

Fig. 11 shows another embodiment of the present invention, wherein Fig. 11(a) is a plan view showing the manufactured garment. The garment has widely protruding ridges 1A with a pattern like argyle check (oblique cross stripes) at the side of the front body part and low crinkles 1B formed within the regions surrounded by the ridges. In the garment illustrated in Fig. 11, rib-stitch like pattern having ridges and grooves similar to the above-described ones are formed at the sleeves, neck portion and the bottom portion. The rib-stitch like portion can be formed in a manner similar to that explained with reference to the above-described embodiment, wherein parallel rows, having a distance of 7 to 10 mm therebetween, are sewn, and while picking up and tucking at the rows of stitches, tuck stitches are sewn by means of a sewing machine.

Fig. 11(b) is a view of the pattern for forming the front body part of the garment illustrated in Fig. 11(a). The front body part and the back body part are sewn together, and further, Tevicon cloth 2 is overlaid on the back body part, and then the pattern illustrated in Fig. 11(b) is drawn on the Tevicon cloth. Fig. 12 is an enlarged view showing the method for sewing the cross stripes of the garment illustrated in Fig. 11, wherein Fig. 12(a) is a plan view, and Fig. 12(b) is a view taken along the cross section and showing the sewing method.

As illustrated in Fig. 12(a), three rows of stitches 61, 62 and 63 are sewn with water-soluble threads, by means of a sewing machine, for the cross stripes, and rows of stitches 67 are sewn at area surrounded by the cross stripes. A wide ridge 1A is created as follows. As illustrated in Fig. 12(b), after the stitches 61, 62 and 63 are sewn, the cloths 11, 12 and 2 are picked up at the stitches 61, which stitches have been sewn at the center toward the front body part 11, which is opposite to the Tevicon cloth 2, by a tucking width S of 10 mm, and tuck stitches 64 are sewn with a water-soluble thread. The portions of the stitches 62 and 63 are picked up in reverse, and end

stitches 65 and 66 are sewn with water-soluble threads spacing 1 to 2 mm from the stitches 62 and 63, respectively. The distance between the rows of stitches 61 and 62 and the distance between the rows of the stitches 61 and 63 were 15 mm in this embodiment. The portion of the diamond pattern has stitches 67 sewn at a pitch of 8 mm. The rib-stitch like portions having ridges and grooves are obtained by sewing stitches at 8 mm pitch with a water-soluble thread and further by sewing end stitches with a water-soluble thread alternately picking up toward the front side and the back side.

After the stitches are sewn as described above, the cloths are subjected to heating treatments twice, in each of which they are heated for 2 minutes at between 140 and 160°C, so as to heat set the cloths, and then the water-soluble threads, Solvron thread in this embodiment, sewn as stitches are solved and removed in hot water. Thus, the body parts as illustrated in Fig. 11 are obtained. In this occasion, wide stripe portion 1A is formed by the stitches 61 to 66 and large wide ridges bulge toward the front side. Small crinkles are formed within the diamond pattern B.

Fig. 13 shows another embodiment of the present invention. Fig. 13(a) is a plan view of the garment manufactured according to the present invention. As illustrated in Fig. 13(a), the garment has wide bulged cable-stitch patterns 1C and 1D formed in the front body part. Further, the garment has wide bulged stripes 1E extending in a vertical direction formed between the cable-stitch pattern 1C and the cable-stitch pattern 1D. Rib-stitch like portion similar to the above-described one is formed at the sleeves, neck portion and the bottom portion.

The cable-stitches are formed with polyester cloth, Tevicon cloth and Solvron thread, i.e., a water-soluble thread. Provisional test was done to examine how much the portion of cable-stitch patterns will contract, and it was confirmed that it contract 71.5 % in a longitudinal direction and 62.5 % in a widthwise direction. Taking this result into consideration, upon

cutting a cloth of garment, the cloth is cut at 1.4 times in the longitudinal direction and 1.6 times in the widthwise direction as large as the desired finish size.

Fig. 14 is a plan view for explaining the stitch forming method for forming the cable-stitch pattern such as illustrated in Fig. 13(a). Tevicon cloth 2 is overlaid on the cloths 1 of garment, and then the pattern illustrated in Fig. 13(b) is drawn on the Tevicon cloth 2, and they are sewn together with a water-soluble thread 3 along the pattern. The detailed constructions of the cable-stitch portions 1C and 1D are illustrated in Figs. 14(a) and 14(b), respectively. In an actually manufactured garment, at the wide cable-stitch portion as illustrated in Fig. 13(a), one cable-stitch portion is formed by a combination of three rows of stitches and tuck stitches around these stitches. This construction is similar to the embodiment explained above with reference to Fig. 12. More specifically, in Fig. 14(a), the distance between the central stitches 61 and the outer stitches 62 or 63 is 1.5 cm. After these stitches 61, 62 and 63 are sewn, the cloths 1 and 2 are picked up at the central stitches 61 toward the front side, which is opposite to the Tevicon cloth 2, by a tucking width of 7 mm, and tuck stitches are sewn with a water-soluble thread. The portions of the stitches 62 and 63 are picked up in reverse, and end stitches are sewn with water-soluble threads. At the portion of the diamond pattern formed between the cable-stitch patterns, there are only stitches 67 sewn first at a pitch of 5 mm but not tuck stitches.

The cable-stitch portion 1D and the vertical wide ridge 1E formed at the sides will now be explained with reference to Fig. 14(b). The wide lines in the cable-stitch portion 1D are formed in a manner similar to that for stitches 61, 62 and 63 as explained with reference to Fig. 14 (a), and after the central stitches are sewn, the cloths are picked up 5 mm from the front side and tuck stitches are sewn. With regard to the stitches 62 and 63, end stitches are sewn while the cloths are picked up reversely.

The wide ridges 1E extending in a vertical direction are formed in a manner which will be described below. Stitches 71, 72 and 76 are sewn with water-soluble threads. As illustrated in Fig. 14(c), the stitches 71 and 72 are picked up in a reverse direction, and end stitches 73 and 74 are sewn with a water-soluble thread. The oblique stitches 76 remain as they are since no tucks are formed there. As illustrated in Fig. 14(c), the portions where the vertical side stitches 71 and 72 were sewn are gathered, picked up toward the front side, and tuck stitches 75 are sewn with a water-soluble thread to form tuck. The cloths are illustrated by a single line in Fig. 14(c) only for explanation of tucking method, however, it should be noted that the line designates the overlaid Tevicon cloth 2 and cloth 1 of a garment. The cloths stitched as described above are heat set in a manner similar to that described above. In this case, the heat set is done at a temperature of between 140 and 170°C for between 60 and 70 sec.

It is preferred that the heat set time is somewhat prolonged when a cloth of a garment is relatively thick. Then, the water-soluble threads 3 used for the stitches are solved and removed, and the Tevicon cloth is peeled off from the garment 1.

The product thus manufactured was like that illustrated in Fig. 13(a), wherein wide ridges like cable-stitch patterns and wide vertical stripes can be seen. The wide vertical stripe is a wide ridge having crinkles bulged on the surface thereof as trace of the stitches sewn obliquely. Although the sleeves, neck portion and the bottom portion have crinkles like rib-stitch, their explanation is omitted here.

Fig. 15 shows a still other embodiment of the present invention, and it shows a sewing method wherein filler is filled to increase the thickness of a cloth for a garment. First, the filler 101 is filled between a cloth 100 for right side including thermoplastic fiber and a cloth 102 for lining including thermoplastic fiber, and under this condition, quilting stitch 81 is sewn with a water-insoluble thread. The filler 101 preferably

comprises thermoplastic fiber, for example, polyester staple fiber. The quilted cloth is cut in a shape of the garment, and the front body part 11 is overlaid on the back body part 12 in such a manner that their lining surfaces are facing to each other, and Tevicon cloth 2 is overlaid on the back body part 12. Under the overlaid condition, as illustrated in, for example, Fig. 15(b), stitches are sewn with a water-soluble thread 3 in an vertically elongated tortoise shell pattern. In the stitches, two rows of stitches make a set, stitches 82 and 83 make a set. At the portion of the vertical tortoise pattern, the stitches 82 and 83 are sewn in parallel forming narrow distance therebetween.

The narrow distance is for example between 2 and 8 mm, and a distance between adjacent two sets of rows of stitches 82 and 83 is wide, and it is at least three times, about five times in the illustrated embodiment, as large as the narrow distance. Thus, a plurality of sets of stitches are sewn. Under this condition, they are heated so as to contract Tevicon cloth 2, and then, the Solvcon thread forming the stitches 82 and 83 are solved and removed. The quilting stitch 81 is sewn with a usual thread but not a water-soluble thread.

Thus, as illustrated in Fig. 15(c), cloth bulged toward the front side is obtained. Fig. 15(d) is a plan view seen from the front surface, wherein the portion sewn with two lines is depressed and the portion surrounded by the two lines forms a projection 1F in a track shaped pattern. Contrary to this, the back side does not project great since it has been in contact with Tevicon cloth, and although it has some crinkles, it does not bulge so much as the front side, and accordingly, it is as a whole somewhat flat. Consequently, when the front body part 11 and the back body part 12 are sewn together, the front body part 11 and the back body part 12 have different appearances, and an amusing garment can be obtained.

When it is required to form large bulges on both the front body part and the back body part, the front body part 11 and the back body part 12 are separated and individually overlaid on a Tevicon cloth 2, and then, they are overlaid in such manner

that their front surfaces 100 face outside while their linings 102 are in contact with the Tevicon cloth 2, and stitches are sewn with water-soluble thread 3 made of Solvcon thread in a above-described manner. After largely bulged projections are formed, they are sewn to each other using them as the front body part and the back body part, and thus a garment having the same pattern on both the front and back body parts can be obtained.

In this case, when the garment illustrated in Fig. 15 (b) was actually manufactured, the shrinkage percentage was 75 % in the longitudinal direction and 80 % in the widthwise direction. Accordingly, taking the shrinkage percentage into consideration, it is preferred to prepare a pattern paper of the garment which is enlarged 1.3 times in the longitudinal direction and 1.25 times in the widthwise direction in relation with the size of the finished garment.

Fig. 16 shows the other embodiment of the present invention, wherein Fig. 16(a) is a plan view of the obtained skirt. For the skirt of this embodiment, velvet is used for the cloth of the garment. As illustrated in Fig. 16(a), ridges 16 appear in a zigzag form, and the bottom portion is pleated.

In order to make such product, the velvet cloth formed in the skirt is overlaid on Tevicon cloth 2. The Tevicon cloth 2 is placed at the back part 12 of the skirt. The pattern illustrated on Fig. 16(b) is drawn on the Tevicon cloth 2. Stitches 84 and 86 are sewn with a water soluble thread 3 except for the bottom portion as illustrated on Fig. 16(b). While the stitches 86 in the widthwise direction are remained as they are, only the oblique stitches 84 are picked up toward the Tevicon cloth side with a tucking width of 3 mm, and tuck stitches 85 are sewn. In this case, sewing of the tuck stitches 85 is stopped just before they cross the straight stitches 86. Fig. 16(b) is a view showing the method for picking up the velvet. More specifically, it shows the portion where the oblique stitches 84 are sewn while they are picked up toward the Tevicon cloth 2. After sewn as described above, the sewn cloths are heated for 2 minutes at a

heating temperature of 160°C , and after a certain interval of time, they are heated again for 2 minutes. Thereafter, the water-soluble thread 3 is solved and removed, and the Tevicon cloth is peeled off.

In the obtained product, as illustrated in Fig. 16(a), no widthwise line can be seen, and the boundaries are depressed, and zigzag forms are bulged. In this case, since the velvet cloth is thick, the contracted condition is not remarkable at the portion of the widthwise stitches 86, and contrary to this, tucked portions are depressed, and the pattern clearly appears.

Fig. 17 shows another embodiment. Fig. 17(a) is a plan view of the finished article, wherein the cloth is thin taffeta made of polyester. As illustrated in Fig. 17(a), crossed large oblique projections 1H are formed on the thin cloth, and large plaits are formed between the cable-like projections 1H. Upon manufacture of this garment, the cloth is cut into parts of the garment, and the parts are sewn in a shape of the garment, and while they are overlaid on Tevicon cloth 2, crossed oblique stitches 87 are sewn at a big pitch as illustrated in Fig. 17(b) with a water-soluble thread 3. Then, the cloths are picked up at the stitches 87, the tucking width in this case is about 1.5 cm, which is larger than that in the above-described embodiments. Stitches 88 are sewn with water-soluble thread while the stitches are always picked up toward the front body part 11. The thus obtained cloths are heated and then the water-soluble thread 3 is solved and removed. Thus, big projections 1H as illustrated in Fig. 17(d) are formed. Fig. 17(d) shows a condition wherein the front body part 11 is overlaid on the back body part 12. As it will be seen from Fig. 17(d), the big projection 1H appears at the front surface while the back body part 12 has depression corresponding to the big projection.

In all the above-explained embodiments, the cloth is sewn in a shape of a garment or is sewn in a part of the shape of the garment, and it is sewn with Solvcon thread while it is overlaid on Tevicon cloth. However, the following method is also

applicable.

After cloth, which has been cut in a shape of the garment but not sewn in the shape of the garment, is sewn together with Tevicon cloth with water-soluble thread, it is heated, and the water-soluble thread is solved and removed so that cloth having crinkles developed thereon is obtained. Then, the cloth may be sewn into the garment.

Alternatively, only cloth may be sewn together with Tevicon cloth with water-soluble thread so as to form crinkles. The treatment of the present invention may be carried out for a cloth, especially when a desired pattern is drawn on the Tevicon cloth, and when stitches are sewn with water-soluble thread along the pattern, and further, when the cloth is picked up at the desired portion of the stitched portions and tuck stitch is sewn. More specifically, since big crinkles may be formed when crinkle forming operation is done under a tucked condition compared with the case wherein the stitches are formed under a flat condition, difference in the crinkled patterns in the front body part and the back body part becomes clear when the treatment is done while front body part and the back body part are overlaid. Because of this, when it is required to form the similar crinkled pattern on the front body part and the back body part, without sewing the front body part and the back body part, the cloth of the garment, which is in a condition of a single piece, is sewn together with the Tevicon cloth with a water-soluble thread, and then it is heated and the water-soluble thread is solved and removed. Thus, the same pattern can be formed on both the front body part and the back body part. In this case, when the pattern is relatively simple, the crinkles may be formed in a cloth before cutting it into parts of a garment. However, when predetermined crinkles has to be positioned at predetermined portions of the garment from design point of view, it is preferred to form crinkles in a cloth after cutting it in a shape of the garment. Thus, the garment of desired design can be obtained easily.

When rib-stitch like article is produced, if the

treatment is done in a cloth condition, tucking has to be done alternately from the front side and the back side. Therefore, it is easy to perform the treatment with short cloth within some meters rather than with a long cloth.

The tucking according to the present invention is done with one row of stitches at the central portion of a tuck and tuck stitches locating both sides of the central stitches, such a central stitches being not in existence in an ordinary pin-tuck. In order to produce a rib-stitch like article, a plurality rows of the central stitches may be sewn first at a predetermined pitch, and for example, every other rows of central stitches may be picked up toward the front side and tuck stitches are sewn, and then turning over the cloths, tuck stitches may be sewn while picking up at the remaining rows of the central stitches.

When large plaits are required, gathers are formed previously with a sewing machine for gathering, and then, it is sewn with Tevicon cloth. Thus, large crinkles which are larger than those created by only contraction of the Tevicon cloth can be formed. The gathering and sewing with Tevicon cloth may be performed simultaneously by means of a sewing machine for gathering. In this case, both the stitches for gathering and the stitches for sewing may be done with water-soluble thread.

As described above, according to the present invention, stitches can be sewn in any optional pattern, and the distance between the rows of the stitches may be widened or narrowed. Accordingly, crinkles in the obtained cloth 1 may be various.

Further, crinkles of the present invention can be formed at any desired portions in a garment. In this case, it is possible to form the crinkles on both the front side and the back side at the same time, or when the garment is opened at the front, it is possible to form crinkles only in the front body part or the back body part, or to form crinkles at the front lapped portions and the center portion of the back body part simultaneously by folding the garment at the center of the front

part in such a manner that sleeves are superimposed on each other and sewing stitches after overlaying thermoplastic cloth 2 on the front lapped portions.

In the above-described explanation, the thermoplastic cloth 2 is overlaid on the garment and the stitches are sewn on them. However, the thermoplastic cloth 2 may be inserted between the cloths 1 of garment, for example between the front body part and the back body part, and they may be sewn together.

According to the present invention, when the cloth of a garment is cut and is sewn in a shape of the garment, the contracting ratio is confirmed previously through an experience, and the cutting and sewing are done based on the result of the experience so that the desired size can be obtained. In other word, even when the same cloth 2 is used as a thermo-shrinkable cloth 2 and is sewn in the same manner, the cloth of garment will contract remarkably when it is thin, while it will not contract remarkably nor form big crinkles due to the force in the cloth of garment when it is thick such as velvet.

The cloth of garment according to the present invention has to be a thermoplastic fiber so as to be heat set. As long as the cloth has such a property, the cloth constructing one garment may be one kind or at least two kinds with respect to its color or material. For example, two kinds of tape-like cloths, which are different in their colors, are sewn together to form a large single cloth, and it may be cut into parts of a garment so as to use as a cloth including thermoplastic fiber of the present invention. Alternatively, for example, when each body part comprises a plurality of pieces of cloths, pattern papers which correspond to the divided body parts are previously prepared, and a plurality of cloths which are different in their colors or shape are cut along such divided pattern paper and are sewn in a body part, and thus obtained body part may be used as a cloth including thermoplastic fiber of the present invention. Further, when crinkles are formed using a cloth obtained by sewing a see-through cloth with a non-see-through cloth as a cloth including

thermoplastic fiber of the present invention, the obtained garment is very amusing both from a design point of view and from aesthetic point of view due to synergistic effects of the see-through effect and the effect of the crinkles.

Industrial Applicability

According to the method of the present invention, crinkles can be formed at almost entire portions of the garment or any desired portion of the garment without any substantial limitation from a design point of view.

Further, according to the method of the present invention, when crinkles are formed at almost entire portions of a garment or any desired portion of the garment using cloth which is thermo-shrinkable in both the weft and warp directions, the garment having crinkles therein can be manufactured, which is capable of being expanded and contracted in both the length and breath directions like knitted article. More specifically, when stitches are sewn on the cloth of garment and the thermo-shrinkable cloth, if the stitches are sewn on almost entire portions of the garment, entire portions of the garment may be expanded and contracted. Since the garment has crinkles at entire portions and since it can expand and contract in length and breadth directions, product having high shrinkability like a knitted fabric can be obtained. Further, when crinkles are formed at the breast, the breast has high expansion. Accordingly, a garment which fits the body well can be obtained without forming any special darts.

Further, when crinkles are formed at entire portions of the garment or any desired portion of the garment using a cloth which is thermo-shrinkable in either warp or weft direction, the garment which can be expanded and contracted in either warp or weft direction can be obtained and is easy to wear as a blouse, slacks, etc.

When crinkles are formed according to the method of the

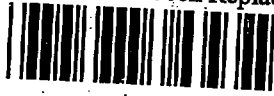
present invention, it is not limited from design different from the formation of knitted fabric, and it is not limited from the directional property which is inherent to a conventional pleating, and thus, variety of design spreads out widely. When stitches are sewn in various curves, curved projections and depressions can be obtained, and thus design becomes very amusing.

According to the method of the present invention, after crinkles are formed in the cloth, a pattern may be printed while the cloth has crinkles. Accordingly, when the obtained garment is worn, the crinkles also expand and contract together with movement of the body, and it is very interesting since the pattern on the garment changes.

Further, according to the method of the present invention, not only crinkles are formed in the cloth of garment but also the surface of the cloth of garment may have many variations. More specifically, if different material such as a polyurethane sheet is adhered to the surface of the cloth, leather like feeling and amusing expression by partially breaking upon expanding the crinkles can be obtained.

Further, according to the method of the present invention, in the process wherein the cloth including thermoplastic fiber is overlaid on the thermo-shrinkable cloth, they are sewn with stitches of a water-soluble thread, the sewn cloths are heated so as to thermally contract the thermo-shrinkable cloth, and then the water-soluble thread is solved and removed, after stitches are sewn, the sewn cloths are tucked at the former stitches and sewn with tuck stitches in parallel with the former stitches with a water-soluble thread. Thus, clear ridges and grooves like rib-stitch or big ridges and grooves like cable-stitch pattern can be formed in a cloth, and clear ridges and grooves can also be formed in a thick cloth. Further, a garment which has such clear ridges and grooves in the cloth thereof can be obtained.

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Claims:

1. Method for forming crinkles in cloth for a garment comprising:

cutting cloth including thermoplastic fiber into parts of the garment;

sewing the parts into a shape of the garment;

overlaying the garment on a thermo-shrinkable cloth and sewing them together with stitches of a water-soluble thread;

heating the sewn cloths by means of heating means under dry heat and without applying any pressure to the cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles in the cloth of the garment; and

solving and removing the water-soluble thread so as to separate the cloth of the garment from the thermo-shrinkable cloth.

2. Method for forming crinkles in cloth for a garment comprising:

cutting cloth including thermoplastic fiber into parts of the garment;

sewing the parts into a shape of the garment;

partially laying at least one piece of thermo-shrinkable cloth on the garment;

sewing the thermo-shrinkable cloth and the garment with stitches of a water-soluble thread;

heating the sewn cloths by means of heating means under dry heat and without applying any pressure to the cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles and gathers in the cloth of the garment; and

solving and removing the water-soluble thread so as to separate the cloth of the garment from the thermo-shrinkable cloth.

3. Method for forming crinkles in cloth for a garment comprising:

cutting cloth including thermoplastic fiber into parts of the garment;





sewing the parts into a shape of the garment;
overlaying the garment on a thermo-shrinkable cloth and
sewing them together with stitches of a water-soluble thread;
heating the sewn cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles in the cloth of the garment;

solving and removing the water-soluble thread so as to separate the cloth of the garment from the thermo-shrinkable cloth; and

before or after solving and removing the water-soluble thread, subjecting the cloth of the garment to sublimation transfer printing.

4. Method for forming crinkles in cloth for a garment comprising:

cutting cloth including thermoplastic fiber into parts of the garment;

sewing the parts into a shape of the garment;

overlaying the garment on a thermo-shrinkable cloth and sewing them together with stitches of a water-soluble thread;

heating the sewn cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles in the cloth of the garment;

solving and removing the water-soluble threads so as to separate the cloth of the garment from the thermo-shrinkable cloth; and

thereafter, adhering a sheet-like material to the cloth of garment.

5. Method for forming crinkles in cloth for a garment comprising:

after cutting cloth including thermoplastic fiber into parts of the garment, overlaying the cut cloth on a shrinkable cloth and sewing them together with first stitches of a water-soluble thread;

sewing the sewn cloths with second stitches of a water-soluble thread parallel to the first stitches in such a manner that the sewn cloths are picked up and tucked at the first



stitches;

heating the stitched cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles in the cloth for the garment; and

solving and removing the water-soluble threads so as to separate the cloth for the garment from the thermo-shrinkable cloth.

6. Method for forming crinkles in cloth for a garment comprising:

cutting cloth including thermoplastic fiber into parts of the garment;

sewing the parts into a shape of the garment;

overlaying the garment on a thermo-shrinkable cloth and sewing them together with first stitches of a water-soluble thread;

sewing the sewn cloth with second stitches of a water-soluble thread parallel to the first stitches in such a manner that the sewn cloths are picked up and tucked at the first stitches;

heating the stitched cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles in the cloth of the garment; and

solving and removing the water-soluble threads so as to separate the cloth of the garment from the thermo-shrinkable cloth.

7. Method for forming crinkles in cloth for a garment, wherein the cloth used for the garment includes thermoplastic fiber, which method comprises:

overlaying the cloth including the thermoplastic fiber on a thermo-shrinkable cloth and sewing them together with first stitches of a water-soluble thread;

sewing the sewn cloths with second stitches of a water-soluble thread parallel to the first stitches in such a manner that the sewn cloths are picked up and tucked at the first stitches;

heating the stitched cloths so as to permit the thermo-





shrinkable cloth to shrink and form crinkles in the cloth including the thermoplastic fiber; and

solving and removing the water-soluble threads so as to separate the cloth including the thermoplastic fiber from the thermo-shrinkable cloth.

8. Method according to any one of claims 5 to 7, wherein the tucked width upon making tucks in the cloths sewn by the first stitches is between 1 to 20 mm.

9. Method according to any one of claims 5 to 7, wherein upon making tucks in the cloths sewn by the first stitches, the picking up is alternately performed from the front side and the back side of the stitched cloths.

10. Method according to any one of claims 5 to 7, wherein three rows of first stitches make a set, each rows of first stitches locating at the center of the tuck upon picking up the cloths sewn by the first stitches and the distance between adjacent rows of the first stitches being between 10 and 20 mm, the sewn cloths are picked up at the first stitches locating at the center of the set by a wide picking up width toward the cloth including the thermoplastic fiber and are tucked with the second stitches of the water-soluble thread,

the sewn cloths are picked up at the rows of the first stitches locating at both sides of the set by a narrow picking up width toward the thermo-shrinkable cloth and are tucked with the second stitches of the water-soluble thread, and

the stitched cloths are heated and the water-soluble threads are removed so that a large projection is formed in the cloths including the thermoplastic fiber as a result of cooperation of the set of the three rows of first stitches and the second stitches forming three tucks at the three rows of first stitches.

11. Method according to any one of claims 1 to 7, wherein after the cloth including the thermoplastic fiber and thermo-shrinkable cloth are overlaid and sewn together with the stitches





of the water-soluble threads, the thermo-shrinkable cloth is cut at least at one position between the adjacent rows of stitches, and thereafter, the sewn cloths are heated.

12. Method for forming crinkles in cloth for a garment comprising:

filling filler between a cloth for right side including thermoplastic fiber and a cloth for lining including thermoplastic fiber, and quilting them with a water-insoluble thread to form a quilted cloth for a garment;

overlaying the quilted cloth on a thermo-shrinkable cloth and sewing them together with stitches of a water-soluble thread, the sewing being done by a plurality of sets, each set comprising two or three rows of stitches parallel to each other by a small distance therebetween, and

adjacent sets forming a distance at least three times larger than the small distance;

heating the sewn cloths so as to permit the thermo-shrinkable cloth to shrink and form crinkles in the quilted cloth; and

thereafter, solving and removing the water-soluble thread so as to separate the quilted cloth from the thermo-shrinkable cloth.

13. Method for forming crinkles in cloth comprising:

overlaying a cloth including thermoplastic fiber on a thermo-shrinkable cloth and sewing them together with first stitches of a water-soluble thread,

sewing the sewn cloths with second stitches of a water-soluble thread parallel to the first stitches in such a manner that the sewn cloths are picked up and tucked at the first stitches;

heating the stitched cloths so as to permit the stitched thermo-shrinkable cloth to shrink and form crinkles in the cloth including thermoplastic fiber; and

thereafter, solving and removing the water-soluble threads so as to separate the cloth including thermoplastic fiber



from the thermo-shrinkable cloth.

14. Method according to claim 13, wherein the tucked width upon making tucks in the stitched cloths is between 1 to 20 mm.

15. Method according to claim 13 or 14, wherein upon making tucks in the cloths sewn by the first stitches, the picking up is alternately performed from the front side and the back side of the stitched cloths.

16. Cloth for a garment, including thermoplastic fiber and having heat setting property, has ridges or grooves, each of which has a first series of needle holes extending in a longitudinal direction thereof at the top of the ridge or the bottom of the groove and each of which has two second series of needle holes extending in a longitudinal direction thereof and parallel to the first series of needle holes at both sides of the first series of needle holes, the second series of needle holes locate at the base portion or intermediate portion of the ridge or groove, and the ridge or groove has small pleats or crinkles formed thereon.

17. Cloth, including thermoplastic fiber and having heat setting property, has ridges or grooves, each of which has a first series of needle holes extending in a longitudinal direction thereof at the top of the ridge or the bottom of the groove and each of which has two second series of needle holes extending in a longitudinal direction thereof and parallel to the first series of needle holes at both sides of the first series of needle holes, the second series of needle holes locate at the base portion or intermediate portion of the ridge or groove, and the ridge or groove has small pleats or crinkles formed thereon.

18. A garment made of cloth, including thermoplastic fiber, the cloth has ridges or grooves, each of which has a first series of needle holes extending in a longitudinal direction thereof at the top of the ridge or the bottom of the groove and each of which has two second series of needle holes extending in



a longitudinal direction thereof and parallel to the first series of needle holes at both sides of the first series of needle holes, the second series of needle holes locate at the base portion or intermediate portion of the ridge or groove, and the ridge or groove has small pleats or crinkles formed thereon.

