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(54) **POLYESTER-BASED-FABRIC HOOK-AND-LOOP FASTENER HAVING EAR SECTION**

(57) **ABSTRACT**

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A polyester-based woven-fabric hook-and-loop fastener having selvage parts including: a base fabric being a woven-fabric made of a warp yarn, a yarn for an engaging element woven in parallel into the warp yarn, and a weft yarn, all being polyester-based yarns; and the engaging element made of the yarn for the engaging element existing on a front face side of the base fabric and having a large number of loop shapes or a large number of hook shapes, rising from a front face of the base fabric,

the weft yarn containing a heat-fusible component, a base of the engaging element being fixed to the base fabric by the heat-fusible component, and

the selvage parts in which the engaging element is not present being present at both end parts in parallel in a warp yarn direction of the base fabric,

in which the polyester-based woven-fabric hook-and-loop fastener satisfies constitutions (1) and (2) described below:

(1) a thickness of the warp yarn in a base fabric thickness direction at a position at which the warp yarn, which alternately runs over and under the weft yarn with the weft yarn interposed therebetween, subducts most toward a rear face side is 0.94 times or less of a thickness thereof at a position at which the warp yarn floats most toward the front face side;

(2) at least one selvage part of the selvage parts existing at both end parts is formed by cutting and removing a base part of the engaging element.

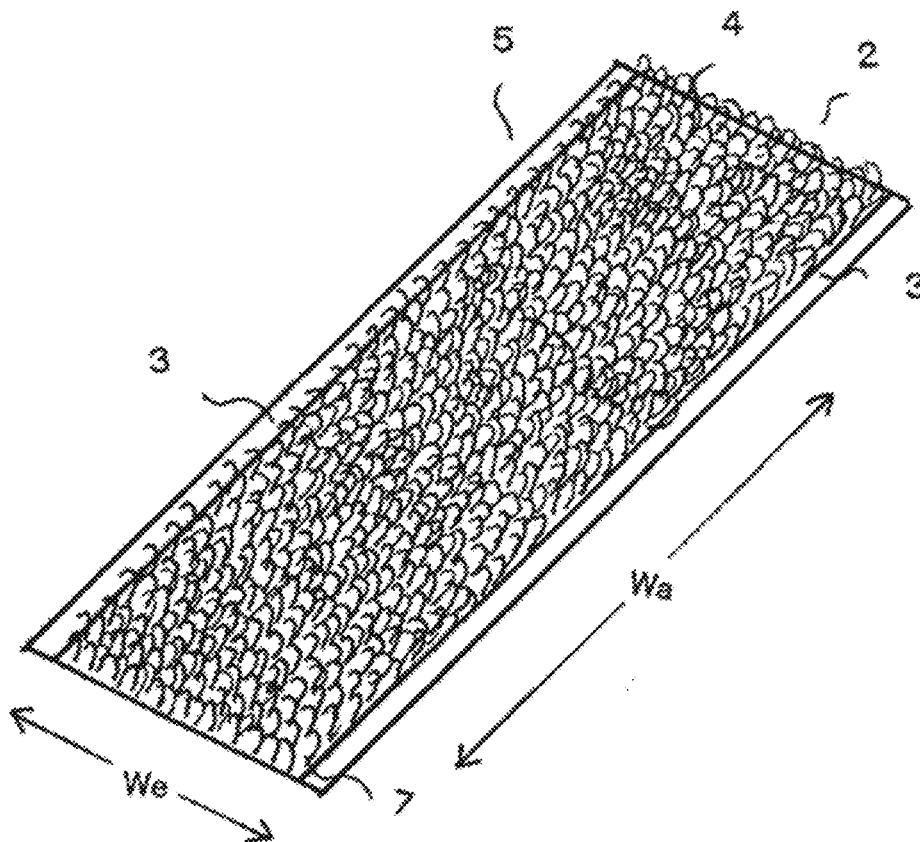


Fig. 1

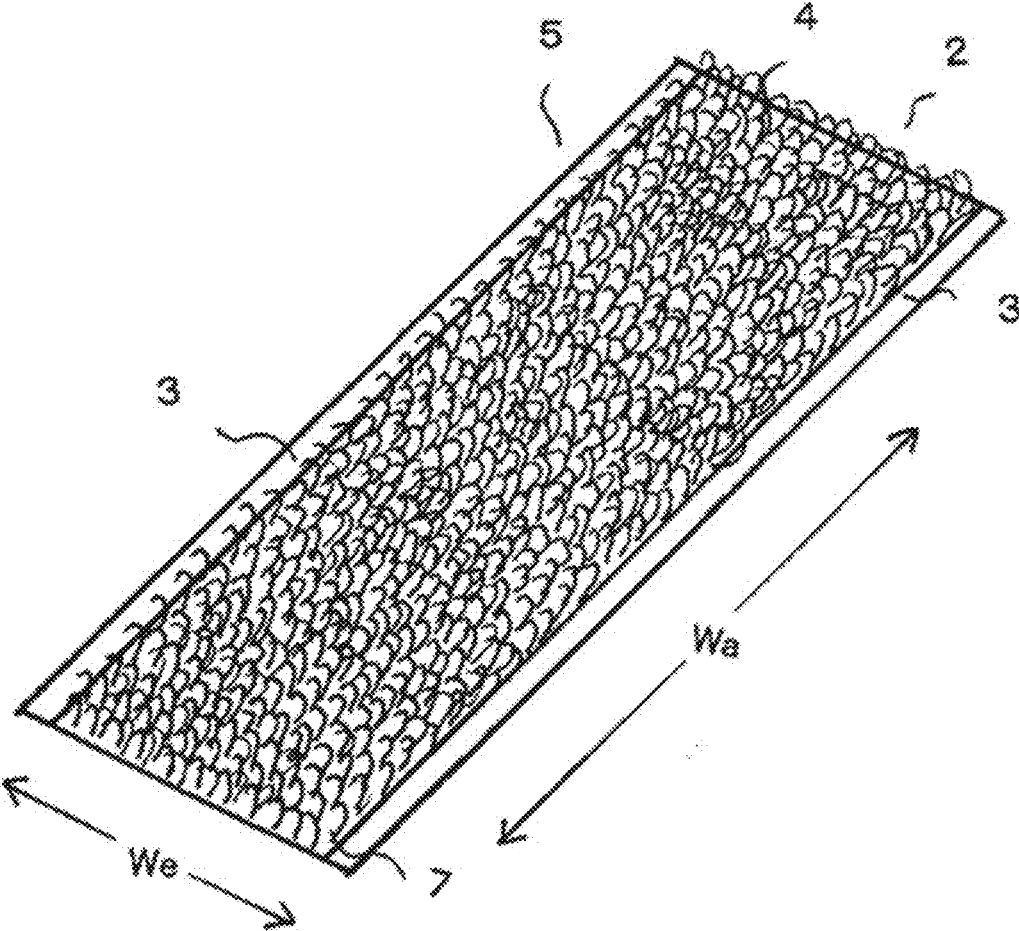


Fig. 2

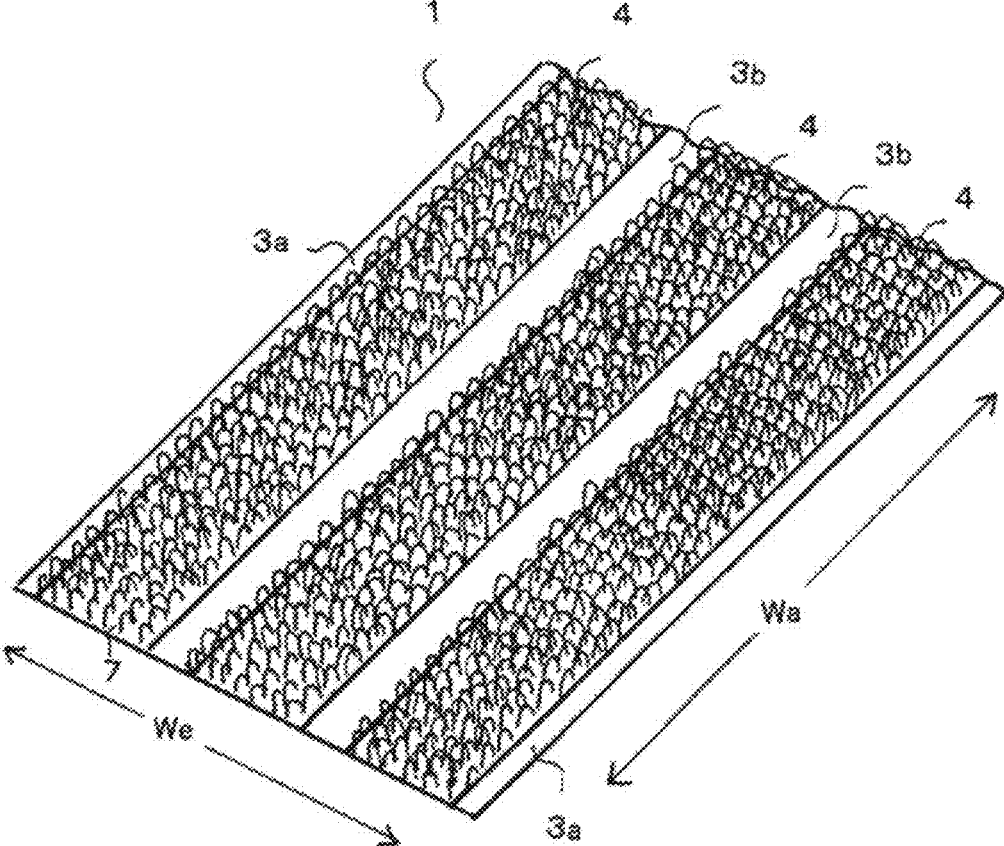


Fig. 3

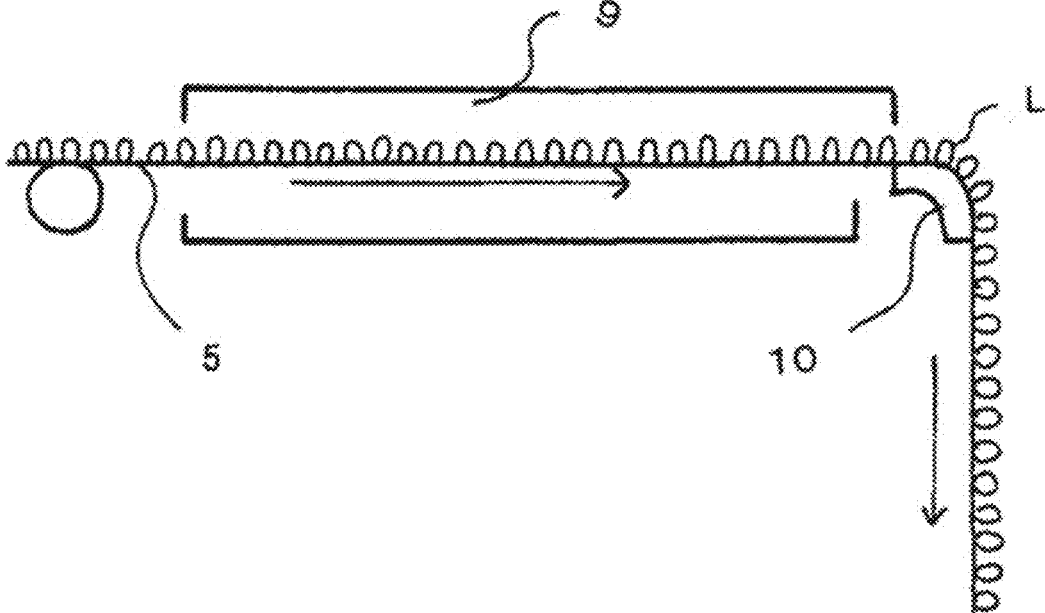


Fig. 4

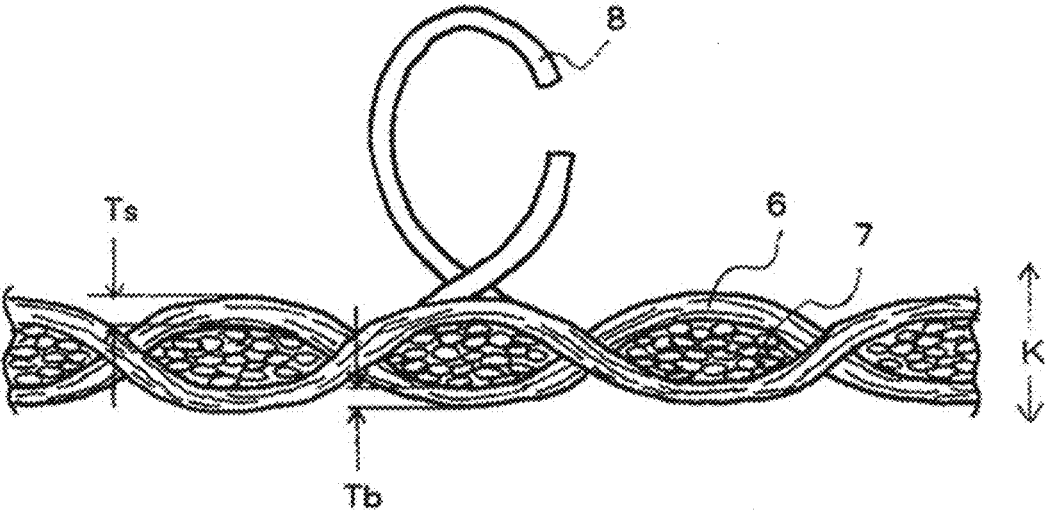
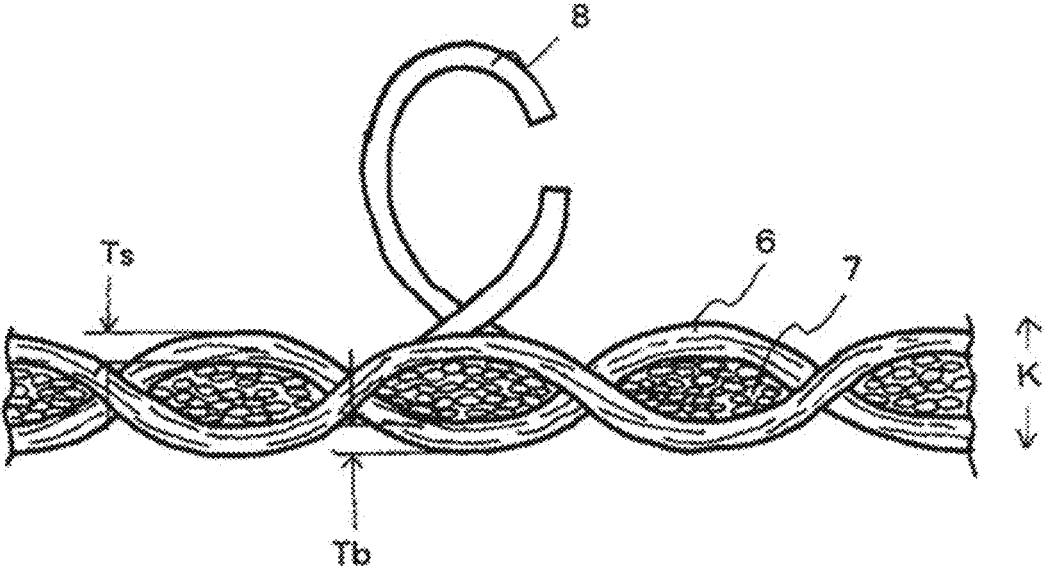


Fig. 5



**POLYESTER-BASED-FABRIC
HOOK-AND-LOOP FASTENER HAVING EAR
SECTION**

TECHNICAL FIELD

[0001] The present invention relates to a polyester-based woven-fabric hook-and-loop fastener having selvage parts at both end parts, which is a book hook-and-loop fastener, a loop hook-and-loop fastener, or a hook-and-loop coexisting type hook-and-loop fastener, each of which is made of a woven-fabric made of a polyester-based yarn, the selvage parts being formed by cutting and removing engaging elements existing on a front face of an area for the selvage part by post-processing, and a method for manufacturing the same.

BACKGROUND ART

[0002] Conventionally, as a hook-and-loop fastener having a woven base fabric, a combination of a so-called woven-fabric-based hook hook-and-loop fastener including a large number of hook-shaped engaging elements made of a monofilament yarn on the front face of a woven base fabric and a so-called woven-fabric-based loop hook-and-loop fastener including a large number of loop-shaped engaging elements made of a multifilament yarn capable of engaging with the hook-shaped engaging elements on the front face of a woven base fabric has been widely used in application fields such as clothes, daily sundries, industrial materials and the like because the engaging elements are not damaged and the engaging force is less reduced even when engagement and peeling are repeated.

[0003] In addition, a so-called hook-and-loop coexisting woven-fabric-based hook-and-loop fastener including both of a large number of the hook-shaped engaging elements and a large number of the loop-shaped engaging elements on the same front face of a woven base fabric is also widely used because one kind of hook-and-loop fastener has both the functions of a hook hook-and-loop fastener and a loop hook-and-loop fastener, so that it is not necessary to use both of the hook hook-and-loop fastener and the loop hook-and-loop fastener in combination, unlike a conventional hook-and-loop fastener, and only one kind of hook-and-loop fastener can be used.

[0004] Such a woven-fabric-based hook-and-loop fastener is produced by, at the time of weaving the woven base fabric, weaving a yarn for the engaging element into a warp yarn in parallel in the woven base fabric such that the yarn for the engaging element is protruded in a loop shape from the front face of the woven base fabric in some places, fixing the loop shape by heating, and then cutting one leg of the loop to form the the hook-shaped engaging element from the loop in the case where the engaging element is the hook-shaped engaging element, or without cutting one leg in the case where the engaging element is the loop-shaped engaging element. In order to prevent the yarn for the engaging element woven in parallel to the warp yarn in the woven base fabric made of the warp yarn and weft yarn from being pulled out from the woven base fabric by a pulling force at the time of peeling the engagement, usually, a urethane-based or acrylic-based resin agent called a back coating adhesive is applied to a rear face of the woven base fabric.

[0005] However, when the adhesive liquid for back coating is applied to the rear face of the woven base fabric and

dried, the organic solvent used in the adhesive liquid deteriorates the working environment, and a process, an apparatus, and time are further required for drying the adhesive liquid. In particular, since the process of weaving the hook-and-loop fastener and the process of coating the rear face with the back coating resin liquid and drying are greatly different in the process passing speed, it is necessary to wind the hook-and-loop fastener once in the middle of the process. As a result, much labor and time are required for the production of the loop-and-hook fastener. In addition, it is necessary to periodically remove the adhesive attached to the apparatus during coating and drying, which also reduces productivity.

[0006] Further, the hook-and-loop fastener with the back coating adhesive liquid tends to lose the flexibility of the woven base fabric due to the adhesive layer existing on the rear face of the woven base fabric and becomes rigid. Therefore, there is a disadvantage that the texture of the woven-fabric or the like to which the hook-and-loop fastener is attached is lowered and the air permeability of the hook-and-loop fastener is lowered. Further, there is also a disadvantage that the adhesive tends to deteriorate with time during use as a hook-and-loop fastener, the fixing force of the yarn for the engaging element is gradually lowered, and the engaging function of the hook-and-loop fastener is lowered.

[0007] Further, in the case where the back coating adhesive is applied to the rear face of the woven base fabric, when such woven-fabric-based hook-and-loop fastener is dyed, the dye liquid cannot penetrate the woven base fabric because of the back coating adhesive layer existing on the rear face, so that uniform and deep dyeing cannot be achieved. For this reason, it is necessary to dye before applying the back coating adhesive. When dyeing is performed before the back coating adhesive is applied, dyeing is performed in a state in which the yarn for the engaging element or the like is not fixed to the woven base fabric. Therefore, movement such as misalignment of the yarn constituting the woven base fabric or the like occurs by the dyeing treatment, and the alignment of the engaging elements is disordered. Further, in the case where the engaging element is a hook-shaped engaging element, when the alignment of engaging elements is disordered, at the time of cutting one leg of the loop for the engaging element to form a hook-shaped engaging element, it is difficult to surely cut only one leg, and there exist cases in which both legs are cut and cases in which both legs are not cut.

[0008] Further, the hook-and-loop fastener is generally produced in the form of a wide and long tape, and at the time of being sold as a product, the hook-and-loop fastener is in a narrow state made of a width-direction central part (engaging element area) in which the engaging element is present and selvage parts which are present at both width-direction end parts thereof and in which the engaging element is not substantially present. These selvage parts are provided in order to facilitate sewing when the hook-and-loop fastener is integrated with the fabric by sewing, and to achieve better appearance. The width thereof is generally in the range of 1 to 5 mm.

[0009] However, when the back coating resin layer is present on the rear face of the hook-and-loop fastener, the selvage part becomes hard, and it is difficult for the sewing needle to penetrate through the selvage part and difficult to attach by sewing.

[0010] As an industrial method for producing such a hook-and-loop fastener with a selvage part, there is generally used a method of, first, weaving a wide base fabric for a hook-and-loop fastener in which an area having a loop for the engaging element corresponding to the engaging element area (area for the engaging element) and a plurality of areas for selvage parts that do not have a loop for the engaging element are alternately present in a weft yarn direction, then providing a processing such as heat treatment for fixing the shape of the engaging element and one-leg cutting for forming the hook-shaped engaging element, and further, cutting (slitting) the wide hook-and-loop fastener base fabric at the substantially intermediate part of the areas for the selvage parts, and to simultaneously obtain a plurality of narrow tape-like hook-and-loop fastener having selvage parts at both width-direction end parts.

[0011] That is, as a method of manufacturing a narrow woven-fabric hook-and-loop fastener with a selvage part, a method of producing a plurality of narrow hook-and-loop fastener tapes simultaneously by first producing a wide woven-fabric tape for hook-and-loop fastener alternately having, in the width direction, a narrow area for engaging element and an area for a selvage part, and then slitting the intermediate of the area for the selvage part in parallel to the warp yarn is generally used in terms of productivity.

[0012] For example, in the case of producing a hook-and-loop fastener tape having a width of 25 mm, a wide woven-fabric tape is first produced, which is designed to project the loop for the engaging element on a portion of about 21 mm to be the area for the engaging element, and repeat the areas for the selvage parts of a portion of about 4 mm at several times in the weft yarn direction, in which the areas for the selvage parts have no yarn for the engaging element, and are parallel to the engaging element area, and then by slitting the area for the selvage part of the wide tape in parallel in the longitudinal direction (warp yarn direction) at the substantially intermediate part, a plurality of woven-fabric hook-and-loop fastener with a tape width of 25 mm having the engaging element area with a width of 21 mm and the selvage part with 2 mm at each of both end parts thereof.

[0013] Although the case of the above-described 25 mm width has been described as an example, commercially available woven-fabric hook-and-loop fasteners have various uses, and there are optimum widths according to the individual uses. Therefore, there are various tape widths such as 10 mm width, 16 mm width, 20 mm width, 24 mm width, 30 mm width, and 38 mm width in addition to 25 mm width. The number of brands is inevitably large when the above-described manufacturing method is used. Therefore, a large number of facilities for weaving are required, a large amount of labor and time are required for changing the tape width, and there are a large amount of stock during the weaving process. Further, in the weaving preparation step, the number of warping for winding the warp yarn and the engaging element yarn in advance also becomes the number of warping corresponding to each of the widths of the engaging element area. Therefore, the number of beam stocks of the warp yarn and the yarn for the engaging element wound around the beam for exclusive use is inevitably large.

[0014] That is, in the case of the method of forming the engaging element area and the area for the selvage part at the stage of weaving the base fabric as described above, since it is required to produce various products with widths of the

engaging element areas, there are problems that a large number of manufacturing facilities are required, stocks in the middle are increased, a large amount of labor and time are required for changing the widths of the engaging element areas, and the number of warping for producing such a hook-and-loop fastener is increased.

[0015] As a technique for solving the above-described problems caused by producing the woven base fabric having the engaging element area and the area for selvage at the weaving stage and further solving the above-described problems caused by the presence of the back coating resin layer, PTL 1 discloses a method for producing a plurality of narrow hook-and-loop fasteners each having selvage parts at both end parts by first weaving a wide base fabric for the hook-and-loop fastener in which engaging elements are present on the entire face of the base fabric, then clipping the engaging elements at a predetermined interval in the width direction to form areas for selvage parts, thereby dividing the wide engaging element area into a plurality of narrow engaging element areas and a plurality of areas for selvage parts continuing in the length direction, and then slitting the center of the area for the selvage part in the width direction.

[0016] When this method is used, the selvage part formation can be carried out after the hook-and-loop fastener producing process, so that it is possible to obtain features of reducing the amount of stock in the middle, shortening the work and time required for changing the width of the engaging element area, and preventing an increase in the number of warping beams and weaving apparatuses.

[0017] Further, PTL 1 describes that by using the heat-shrinkable yarn including a heat-fusible component as the weft yarn constituting the base fabric, a base of the engaging element is fixed by a melt of the heat-fusible component, and further, by fastening the base of the engaging element by utilizing the heat shrinkability of the yarn, the engaging element is not pulled out from the base fabric even when the engagement and peeling are repeated, and as a result, the application of the back coating resin performed in the conventional hook-and-loop fastener is unnecessary, and the above-described problems due to the presence of the back coating resin can be solved.

[0018] Further, PTL 1 describes that, since the warp yarn, weft yarn, and yarn for the engaging element are all polyester-based yarns and have extremely low water absorption and moisture absorption properties, the hook-and-loop fastener base fabric hardly has a waving shape due to water absorption and moisture absorption of a nylon yarn as in the case of a conventional general hook-and-loop fastener using a nylon-based yarn, and therefore the problem of an unstable cut position when the engaging element is cut to form the selvage part does not occur, and therefore when the engaging element is cut off, the problem that a stump remains high or on the other hand, that the base fabric is shaved off hardly occurs.

[0019] However, it is insufficient to prevent the engaging element from being pulled out from the base fabric face due to the repetition of the engagement and peeling of the engaging element only by using the heat-shrinkable yarn containing the heat-fusible component as the weft yarn as described in PTL 1, and it is required to further enhance the pull-out resistance of the engaging element.

[0020] As a technique for further improving such pull-out resistance of the engaging element, PTL 2 describes a hook-and-loop fastener in which a polyester-based heat-

shrinkable yarns are used for all of the warp yarn, the weft yarn, and the yarn for the engaging element, a yarn containing a heat-fusible component is further used as the yarn constituting the weft yarn, and the yarn for the engaging element is fixed to the woven base fabric by fusion of the heat-fusible component and heat shrinkage of all the yarns constituting the hook-and-loop fastener.

[0021] When the technique described in PTL 2 is used in the method described in PTL 1, the base of the engaging element is further tightened by the heat shrinkage of not only the weft yarn but also the warp yarn and the yarn for the engaging element, so that the pull-out resistance of the engaging element is greatly improved. However, on the other hand, in the treatment step of fusing the heat-fusible component and heat-shrinking a constituent yarn in the stage of producing the hook-and-loop fastener, uneven heat shrinkage newly occurs, and the hook-and-loop fastener base fabric is in a waving state (that is, a state in which the hook-and-loop fastener floats and subducts in the up-and-down direction in a wakame seaweed manner).

[0022] Therefore, it has been found that even when the occurrence of the waving shape of the hook-and-loop fastener base fabric due to water absorption and moisture absorption is reduced by using the polyester-based yarn having low water absorption and moisture absorption as compared to the case of using the nylon-based yarn, there is a newly occurring problem that the cut position when the engaging element is cut to form the selvage part is unstable due to the non-uniform heat shrinkage newly occurred by the heat shrinkage in the heat treatment step, so that a high stump remains or, on the other hand, the base fabric is shaved off.

CITATION LIST

Patent Literature

[0023] PTL 1: JP2014-27989A

[0024] PTL 2: WO2005/122817

SUMMARY OF INVENTION

Technical Problem

[0025] The present invention has been made to solve the above-described problems of the prior art, that is, it is to provide a woven-fabric hook-and-loop fastener with selvage parts in which a large number of weaving facilities and beam stocks of a warp yarn and a yarn for an engaging element are not required, a large amount of labor and time are not required for changing a tape width, and a large number of stocks are not required in the middle of the process, and the hook-and-loop fastener is rarely in a waving state in the up-and-down direction at the time of clipping the engaging element existing thereon, to form an area for a selvage part, and as a result, the hook-and-loop fastener having a selvage part has an engaging element accurately cut in the vicinity of the base of the engaging element; the woven-fabric hook-and-loop fastener with selvage parts having pull-out resistance of the engaging element greatly improved in spite of the absence of the back coating resin layer; and a method for producing the same.

Solution to Problem

[0026] That is, the present invention is a polyester-based woven-fabric hook-and-loop fastener having selvage parts including: a base fabric being a woven-fabric made of a warp yarn and a weft yarn, both being polyester-based yarns and a yarn for an engaging element woven in parallel into the warp yarn; and the engaging element made of the yarn for the engaging element existing on a front face side of the base fabric and having at least one kind of shape selected from the group consisting of a large number of loop shapes and a large number of hook shapes, raising from a front face of the base fabric,

[0027] the weft yarn containing a heat-fusible component,

[0028] a base of the engaging element being fixed to the base fabric by the heat-fusible component, and

[0029] the selvage parts in which the engaging element is not present being present at both end parts in parallel in a warp yarn direction of the base fabric,

[0030] in which the polyester-based woven-fabric hook-and-loop fastener satisfies constitutions (1) and (2) described below:

(1) a thickness of the warp yarn in a base fabric thickness direction at a position at which the warp yarn, which alternately runs over and under the weft yarn with the weft yarn interposed therebetween, subducts most toward a rear face side is 0.94 times or less of a thickness thereof at a position at which the warp yarn floats most toward the front face side;

(2) at least one selvage part of the selvage parts existing at both end parts is formed by cutting and removing a base part of the engaging element.

[0031] Further, preferably, the present invention is a polyester-based woven-fabric hook-and-loop fastener having selvage parts including: a base fabric being a woven-fabric made of a warp yarn, a yarn for an engaging element woven in parallel into the warp yarn, and a weft yarn, all being polyester-based yarns; and the engaging element made of the yarn for the engaging element existing on a front face side of the base fabric and having at least one kind of shape selected from the group consisting of a large number of loop shapes and a large number of hook shapes, rising from a front face of the base fabric,

[0032] the weft yarn containing a heat-fusible component,

[0033] a base of the engaging element being fixed to the base fabric by the heat-fusible component, and

[0034] the selvage parts in which the engaging element is not present being present at both end parts in parallel in a warp yarn direction of the base fabric,

[0035] in which the polyester-based woven-fabric hook-and-loop fastener satisfies constitutions (1) and (2) described above.

[0036] Further, preferably, in the polyester-based woven-fabric hook-and-loop fastener having the selvage parts, it is a case where the thickness of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side is in the range of 0.7 to 0.90 times the thickness thereof at the position at which the warp yarn floats most toward the front face side. Further, preferably, in the polyester-based woven-fabric hook-and-loop fastener having the selvage parts, it is a case where a back coating resin layer for fixing the engaging element to the base fabric is not present on the rear face of the base

fabric. Further, preferably, in the polyester-based woven-fabric hook-and-loop fastener having the selvage parts, it is a case where a pull-out force of the engaging element from the base fabric is 5.5 N or more. Further, preferably, it is a case where the woven-fabric hook-and-loop fastener is dyed with a disperse dye.

[0037] Moreover, the present invention is a method for producing a polyester-based woven-fabric hook-and-loop fastener having selvage parts, the polyester-based hook-and-loop fastener including: a base fabric being a woven-fabric woven from a warp yarn and a weft yarn, both being polyester-based heat-shrinkable yarns, and a yarn for an engaging element; and the engaging element which has at least one kind of shape selected from the group consisting of a loop shape and a hook shape, formed by raising the yarn for the engaging element from a front face of the base fabric,

[0038] the weft yarn containing a heat-fusible component, and

[0039] a base of the engaging element rising from the front face of the base fabric being fixed to the base fabric by fusion of the heat-fusible component,

[0040] in which [step 1] to [step 6] described below are performed in this order:

[0041] [step 1] a step of weaving the base fabric in which the yarn for the engaging element is woven in parallel to the warp yarn and a large number of loops for engaging elements formed of the yarn for the engaging element and rising from the front face of the base fabric are present on a front face side of the base fabric;

[0042] [step 2] a step of guiding the base fabric to a heating region, heating at a temperature equal to or higher than a temperature at which the heat-fusible component is melted, a heat-shrinking yarn constituting the base fabric, and allowing a melt from the weft yarn to penetrate into the base fabric;

[0043] [step 3] a step of taking out the base fabric from the heating region and pressing a rear face of the base fabric against a fixed surface or a roll surface in a state in which the heat-fusible component is melted;

[0044] [step 4] a step of, after cooling the base fabric, when the loops for the engaging elements existing on the front face of the base fabric are for hook-shaped engaging elements, cutting one leg of the loops to form the hook-shaped engaging elements;

[0045] [step 5] a step of removing the engaging elements by cutting vicinity of the base of the engaging element continuously in a warp yarn direction of the base fabric at a predetermined interval in a weft yarn direction of the base fabric to continuously form an area for the selvage parts in which the engaging element is not present and an engaging element area in the warp yarn direction of the base fabric;

[0046] [step 6] a step of continuously forming, in the warp yarn direction of the base fabric, a plurality of engaging element areas having the selvage parts at both side parts in the weft yarn direction by cutting, in the warp yarn direction, a substantially intermediate part of the area for the selvage parts in the weft yarn direction to form the selvage parts.

[0047] Preferably, the present invention is a method for producing a polyester-based woven-fabric hook-and-loop fastener having selvage parts, the polyester-based hook-and-loop fastener including: a base fabric being a woven-fabric

woven from a warp yarn, a weft yarn, and a yarn for an engaging element, all being polyester-based heat-shrinkable yarns; and the engaging element which has at least one kind of shape selected from the group consisting of a loop shape and a hook shape, formed by raising the yarn for the engaging element from a front face of the base fabric,

[0048] the weft yarn containing a heat-fusible component, and

[0049] a base of the engaging element rising from the front face of the base fabric being fixed to the base fabric by fusion of the heat-fusible component,

[0050] in which [step 1] to [step 6] described above are performed in this order.

[0051] Moreover, preferably, it is a case where [step 3] is performed by a method in which the base fabric is allowed to run while sliding on the fixed surface while pressing the rear face of the base fabric against the fixed surface, and a running direction of the base fabric is changed on the fixed surface, and further, preferably, it is a case where [step 3] is performed by utilizing a residual heat of [step 2] following [step 2] without once cooling the base fabric taken out from [step 2].

[0052] Further, preferably, in the method for producing a polyester-based woven-fabric hook-and-loop fastener having selvage parts, it is a case where wherein [step 1] to [step 4] are continuously performed without winding in a middle. Further, preferably, in the method for producing a polyester-based woven-fabric hook-and-loop fastener having selvage parts, it is a case where [step 3] is performed without pressing the front face side of the base fabric against the fixed surface or the roll surface. Further, preferably, in the method for producing a polyester-based woven-fabric hook-and-loop fastener having selvage parts, it is a case where a dry-heat shrinkage percentage at 180° C. of the warp yarn used for the woven-fabric is in a range of 5 to 20%, and the dry-heat shrinkage percentage at 180° C. of the weft yarn and the yarn for the engaging element are both in a range of 15 to 30%. Moreover, preferably, it is a case where the woven-fabric hook-and-loop fastener is dyed with a disperse dye between [step 5] and [step 6] or after [step 6].

Advantageous Effects of Invention

[0053] Since the hook-and-loop fastener of the present invention is made of polyester-based yarns, the waving in an up-and-down direction of the hook-and-loop fastener base fabric due to water absorption and moisture absorption is solved as compared with the conventional hook-and-loop fastener made of nylon-based yarns. As a result, when the area for the selvage part is formed, the problem that high stumps remain due to variations in cut height caused by the waving or on the other hand, the front face of the base fabric is cut off can be solved.

[0054] Further, in order to further enhance the pull-out resistance of the engaging element, in the present invention, since polyester-based yarns containing a heat-fusible component are used as the weft yarn and the warp yarn, the occurrence of a new problem that the hook-and-loop fastener base fabric is waving in the up-and-down direction due to new heat shrinkage of these constituent yarns, whereby the high stumps remain due to variations in cut height caused by the waving or on the other hand, the front face of the base fabric is shaved off when the area for the selvage part is formed is solved by [step 3] described above, that is, by performing the step of pressing the rear face of the base

fabric against the fixed surface or the roll surface in a state where the heat-fusible component is melted.

[0055] In a preferable embodiment of the present invention, a polyester-based yarn containing a heat-fusible component is used as the weft yarn, and heat-shrinkable polyester-based yarns are used as the warp yarn, the weft yarn, and the yarn for the engaging element (sometimes these yarns are collectively referred to as hook-and-loop fastener constituent yarns), the occurrence of a new problem that the hook-and-loop fastener base fabric is waving in the up-and-down direction due to new heat shrinkage of these constituent yarns, whereby the high stumps remain due to variations in cut height caused by the waving or on the other hand, the front face of the base fabric is shaved off when the area for the selvage part is formed is solved by [step 3] described above, that is, by performing the step of pressing the rear face of the base fabric against the fixed surface or the roll surface in a state where the heat-fusible component is melted.

[0056] Therefore, in the hook-and-loop fastener with selvage parts according to the present invention, the base of the engaging element can be surely cut at a height at which the base is substantially flush with the front face of the base fabric, and therefore, there is no problem that the stumps remain tall or on the other hand, the front face of the base fabric is shaved off. In addition, since no waving in the up-and-down direction is formed in the hook-and-loop fastener base fabric, when the hook-and-loop fastener is dyed with a disperse dye liquid, a drift of the dye liquid is less likely to occur. As a result, a hook-and-loop fastener dyed in a uniform color tone without dyeing unevenness can be obtained, and the occurrence of new waving in the up-and-down direction during dyeing can be reduced.

[0057] In addition, since all of the hook-and-loop fastener constituent yarns are heat-shrinkable yarns, the base of the engaging element is firmly tightened, the yarn for the engaging element is fixed to the base fabric by the fusion of the heat-fusible component, the yarn for the engaging element is press-bonded to the heat-fusible component by the [step 3], and the melt of the heat-fusible component is extruded by the press-bonding and penetrates into the adjacent yarns to increase the bonding force, and the like, which are combined with one another, therefore, the engaging element is firmly fixed to the woven base fabric. As a result, the engaging element is hardly pulled out from the base fabric even when the hook-and-loop fastener is repeatedly engaged and peeled.

[0058] In the hook-and-loop fastener of the present invention, since it is not necessary to apply the back coating resin liquid to the rear face of the hook-and-loop fastener base fabric as in the conventional hook-and-loop fastener, problems such as deterioration of the flexibility of the hook-and-loop fastener due to the back coating resin, and lack of stability of the back coating resin liquid, do not occur, and further, problems such as deterioration of the working environment due to solvent vapor or the like of the back coating resin liquid when the resin liquid is applied and dried, or a decrease in productivity due to the time and effort required for application and drying, do not occur. Further, a problem of preventing uniform dyeing of the hook-and-loop fastener by the presence of the back coating resin layer as a film on the rear face of the hook-and-loop fastener, and a problem of hardening of the hook-and-loop fastener by the presence of the back coating resin layer on the rear face,

whereby it is difficult for the sewing needle to penetrate into the selvage part at the time of sewing, do not occur.

[0059] Furthermore, in the present invention, since the selvage part is formed by clipping the engaging element after weaving a wide fabric, it is excellent in quick delivery. Further, unlike the conventional method, there is no problem in that a large number of facilities for weaving a hook-and-loop fastener and beam stocks of a warp yarn and a yarn for an engaging element are required, a large amount of labor and time are required for changing a tape width, and furthermore, the stocks in the middle of the process is increased.

BRIEF DESCRIPTION OF DRAWINGS

[0060] FIG. 1 is a perspective view schematically showing an example of a hook-and-loop fastener having selvage parts according to the present invention.

[0061] FIG. 2 is a perspective view schematically showing an example of a hook-and-loop fastener according to the present invention before a substantially middle part of an area for a selvage part is cut.

[0062] FIG. 3 is a view schematically showing an example of a heat treatment apparatus used in a heat treatment suitably used in the production of the hook-and-loop fastener having selvage parts according to the present invention.

[0063] FIG. 4 is a view schematically showing a cross section in a plane parallel to the warp yarn of the woven base fabric when [step 3] is performed in a preferable example of the hook-and-loop fastener having the selvage parts according to the present invention.

[0064] FIG. 5 is a view schematically showing a cross section of the woven base fabric of the hook-and-loop fastener having the selvage parts in a plane parallel to the warp yarn when [step 3] is not performed.

DESCRIPTION OF EMBODIMENTS

[0065] Hereinafter, the present invention is explained in detail. First, the polyester-based hook-and-loop fastener of the present invention is roughly classified into three types: a hook hook-and-loop fastener in which only a hook-shaped engaging element is present on a front face of the woven base fabric, a loop hook-and-loop fastener in which only a loop-shaped engaging element is present on a front face of the woven base fabric, and a hook-and-loop coexisting type hook-and-loop fastener in which a hook-shaped engaging element and a loop-shaped engaging element coexist on a front face of the woven base fabric.

[0066] Among these, the hook hook-and-loop fastener is mainly formed of a monofilament yarn for a hook-shaped engaging element, a multifilament yarn for a warp yarn, and a multifilament yarn for a weft yarn. Further, the loop hook-and-loop fastener is mainly formed of a multifilament yarn for a loop-shaped engaging element, a multifilament yarn for a warp yarn, and a multifilament yarn for a weft yarn. Moreover, the hook-and-loop coexisting type hook-and-loop fastener in which the hook-shaped engaging element and the loop-shaped engaging element coexist on the same front face is mainly formed of a monofilament yarn for the hook-shaped engaging element, a multifilament yarn for the loop-shaped engaging element, a multifilament yarn for a warp yarn, and a multifilament yarn for weft yarn.

[0067] Further, when necessary, a small amount of yarn other than the above-described yarn can be woven into the hook-and-loop fastener, or no yarn other than the above-described yarn can be woven thereinto.

[0068] In the present invention, the warp yarn and the weft yarn are required to be substantially made of a polyester-based resin in order to prevent the occurrence of a waving phenomenon (a state in which the face of the base fabric of the hook-and-loop fastener irregularly moves up and down and does not become a horizontal surface) due to water absorption and moisture absorption, to firmly bond the yarns to each other by heat fusion, to prevent the yarns from yellowing in the heat fusion step, and to simultaneously dye the attached hook-and-loop fastener in the same color when clothes and daily sundries are dyed since polyester-based yarns are used for these products. From this point of view, it is preferable that the warp yarn, the weft yarn, and the yarn for the engaging element are substantially made of a polyester-based resin.

[0069] Specifically, since the above-described requirements can be highly achieved, a multifilament yarn made of polyethylene terephthalate-based polyester is preferably used for the warp yarn, a monofilament yarn made of polyethylene terephthalate-based polyester is similarly preferably used for the yarn for the hook-shaped engaging element, a multifilament yarn made of polybutylene terephthalate-based polyester is preferably used for the yarn for the loop-shaped engaging element, and a polyester-based multifilament yarn is also used for the weft yarn.

[0070] The polyethylene terephthalate-based polyester suitably used for the warp yarn and the yarn for the hook-shaped engaging element is a polyester having an ethylene terephthalate unit as a repeating unit, and is preferably a polyester obtained by a condensation reaction of terephthalic acid and ethylene glycol. A small amount of copolymer units other than terephthalic acid and ethylene glycol can be added.

[0071] Further, a small amount of other polymers can be added to the polyester.

[0072] The weft yarn is also required to be a polyester-based yarn, specifically, a yarn containing a polyester-based low-melting-point heat-fusible resin (sometimes referred to as a heat-fusible component), that is, a polyester-based resin having a melting point far lower than that of a polyethylene terephthalate-based resin constituting the warp yarn and the hook-shaped engaging element. As the heat-fusible resin having a low melting point, a polyethylene terephthalate-based or polybutylene terephthalate-based polyester obtained by copolymerizing a large amount of a copolymerization component other than terephthalic acid, ethylene glycol and butanediol, for example, isophthalic acid, diethylene glycol or the like is suitably used in order to lower the melting point.

[0073] Further, the yarn for the loop-shaped engaging element is also preferably a polyester-based yarn, and a yarn made of a polybutylene terephthalate-based polyester is suitably used from the viewpoint of particularly excellent dyeability, flexibility, round loop formability, and retainability for such a round loop shape, but a polyethylene terephthalate-based polyester can also be used. Further, when the loop-shaped engaging element made of polybutylene terephthalate-based polyester or polyethylene terephthalate-based polyester is present, the melting point of the heat-fusible resin used in the weft yarn is required to be

considerably lower than that of the polybutylene terephthalate-based polyester or polyethylene terephthalate-based polyester used in the loop-shaped engaging element.

[0074] However, in the warp yarn and the weft yarn, a yarn (fiber) assisting the above-described function, for example, a yarn such as a polyphenylene sulfide (hereinafter, abbreviated as PPS) fiber, a polyetherimide fiber (hereinafter, abbreviated as PEI), or a polyamide-based fiber can be used with a polyester-based yarn within a range satisfying the effect of the present invention.

[0075] Further, in the yarn for the engaging element, a yarn (fiber) corresponding to a function can be used instead of the polyester-based yarn or together with the resin of the polyester-based yarn. However, the yarn for the engaging element is preferably a polyester-based resin. Examples of the fibers include PPS fibers, PEI fibers, and polyamide-based fibers.

[0076] Further, in the present invention, it is necessary that all of the warp yarn, the weft yarn and the yarn for the engaging element used for producing the hook-and-loop fastener have heat shrinkability in order to prevent the engaging element from being pulled out from the base fabric, and it is preferable that the dry-heat shrinkage percentage at 180° C. of the warp yarn is in a range of 5 to 20% and the dry-heat shrinkage percentage at 180° C. of the weft yarn and the yarn for the engaging element is in a range of 15 to 30%. The reason why the dry-heat shrinkage percentage of warp yarn is lower than that of other yarns is to stabilize the weaving process.

[0077] Note that the dry-heat shrinkage percentage at 180° C. defined in the present invention is a value obtained by allowing a yarn of 50 cm in a free state to stand in an atmosphere at 180° C. for 1 minute and measuring the shrinkage percentage of the shrunk yarn after 1 minute. With regard to the heat-shrinkable yarn, yarns having various dry-heat shrinkage percentages are commercially available from synthetic fiber manufacturers, but many general-purpose products have a low dry-heat shrinkage percentage at 180° C. by sufficient heat setting in the production process, thereby minimizing shrinkage and wrinkling during ironing and shrinkage and wrinkling during high-temperature high-pressure dyeing. Therefore, it is preferable to select a product having the above-described high shrinkage percentage, which is different from such general-purpose products.

[0078] As the thickness of the multifilament yarn constituting the warp yarn, a multifilament yarn made of 18 to 38 filaments and having a total decitex of 80 to 180 decitex is preferable, and a multifilament yarn made of 24 to 37 filaments and having a total decitex of 90 to 170 decitex is particularly preferable.

[0079] As the thickness of the multifilament yarn constituting the weft yarn, a multifilament yarn made of 32 to 64 filaments and having a total decitex of 150 to 300 decitex is preferable, and a multifilament yarn made of 40 to 56 filaments and having a total decitex of 180 to 250 decitex is particularly preferable.

[0080] Further, the weft yarn must contain a low-melting polyester, that is, a heat-fusible component. Representative examples of such a multifilament yarn containing a heat-fusible component include a multifilament yarn made of a core-sheath type heat-fusible filament in which the sheath component is a low-melting polyester (that is, a heat-fusible component). Since the weft yarn contains the heat-fusible component, the yarn for the hook-shaped engaging element

can be fixed to the woven base fabric, and it is not necessary to apply a polyurethane-based or acrylic-based back coating adhesive to the rear face of the base fabric of the hook-and-loop fastener in order to prevent the engaging element from being pulled out from the woven base fabric as in the conventional hook-and-loop fastener.

[0081] It is also possible to fix the yarn for the engaging element to the base fabric by using a yarn containing a heat-fusible component in the warp yarn instead of the weft yarn. However, since the yarn for the engaging element is threaded into the base fabric in parallel to the warp yarn, the warp yarn has a far fewer position intersecting with the yarn for the engaging element compared to the weft yarn. Therefore, when a heat-fusible yarn is used only in the warp yarn, it is difficult to firmly fix the yarn for the engaging element to the base fabric.

[0082] Examples of the multifilament yarn made of the core-sheath type heat-fusible filament include a multifilament yarn made of a polyester-based filament having a core-sheath type cross section in which the core component does not melt under a heat treatment condition but the sheath component melts. Specifically, a representative example include a multifilament yarn made of a core-sheath type polyester filament containing, a polyethylene terephthalate homopolymer as a core component, copolymerized polyethylene terephthalate or copolymerized polybutylene terephthalate as a sheath component, which is obtained by copolymerizing a large amount, for example, 20 to 30 mol %, of a copolymerization component represented by isophthalic acid, adipic acid, or the like to significantly lower the melting point or softening point (in the present invention, when crystals are not formed by copolymerization or the like and instead a softening point is present, such a softening point is referred to as a melting point).

[0083] The melting point of the sheath component of the multifilament yarn made of the core-sheath type polyester-based heat-fusible filament is in the range of 130 to 210° C., and is preferably 20 to 150° C. lower than the melting point of the warp yarn, the core component, the monofilament yarn for the hook-shaped engaging element, or the multifilament yarn for the loop-shaped engaging element. The cross-sectional shape of the core-sheath type heat-fusible filament can be a concentric core-sheath, an eccentric core-sheath, a single-core core-sheath, or a multi-core core-sheath. Preferably, it is a case of a single core-sheath composite component.

[0084] Furthermore, regarding the proportion of the polyester-based core-sheath type heat-fusible filament in the weft yarn, particularly when all of the weft yarn is substantially formed of the core-sheath type polyester based heat-fusible filament, that is, when the weft yarn is a multifilament yarn made of the core-sheath type polyester-based heat-fusible filament, both the yarn for the hook-shaped engaging element and the yarn for the loop-shaped engaging element are firmly fixed to the base fabric, thus it is preferable.

[0085] When the filament constituting the weft yarn does not have a sheath-core cross-sectional shape but the entire component cross section is formed of a heat-fusible polymer, a heat-fusible polymer that has been solidified again after being melted is brittle and easily breaks, and therefore, the base fabric, for example, when sewn, easily begins to rupture at a sewing thread portion. Thus, the heat-fusible fiber preferably contains a resin that is not heat-fused, and particularly preferably has a sheath-core cross-sectional

shape. Further, the ratio of the core component and the sheath component by weight is in the range of 85:15 to 40:60, and particularly preferably in the range of 80:20 to 60:40.

[0086] The hook-shaped engaging element is required to have so-called hook-shape retainability and rigidity, that is, the hook shape is not extended by light force, and therefore a thick monofilament yarn is used. In the present invention, as the monofilament yarn, there is used a monofilament yarn which is formed from a polyethylene terephthalate homopolymer excellent in hook shape retainability and heat-shrinks without melting at a temperature at which the heat-fusible multifilament yarn is heat-fused, more preferably a monofilament yarn having the above-described dry-heat shrinkage percentage.

[0087] The thickness of the monofilament yarn for the hook-shaped engaging element preferably has a diameter of 0.15 to 0.22 mm, and more preferably a diameter of 0.16 to 0.20 mm, in view of engaging force. Further, in order to increase the engaging force, the cross-sectional shape of the monofilament can be a variant cross-sectional shape represented by a polygonal shape-based such as a triangular shape or a quadrangular shape.

[0088] The yarn for the loop-shaped engaging element is preferably made of a polyethylene terephthalate-based or polybutylene terephthalate-based polyester, and a multifilament yarn made of a polyester that does not melt at the temperature at which the heat-fusible multifilament yarn is heat-fused, particularly a polybutylene terephthalate-based polyester, is preferable because the occurrence of nonuniform shrinkage of the hook-and-loop fastener and the formation of a waving shape in the up-and-down direction in the hook-and-loop fastener can be prevented at a high degree in the heat treatment step or the dyeing step, and dyeing to a deep color can be performed under milder dyeing conditions.

[0089] The yarn for the loop-shaped engaging element is more preferably a multifilament yarn made of polybutylene terephthalate containing 1 to 8% by weight of polytrimethylene terephthalate. In such a multifilament yarn, the filaments constituting the loop-shaped engaging element are easily loosened, and the filaments constituting the multifilament yarn are hardly cut by a loosening treatment using a card clothing or the like when such a treatment is performed, and are hardly cut even when the engagement and peeling are repeated, and as a result, the engagement strength force is improved. Further, deep color dyeing can be carried out under mild dyeing conditions with a disperse dye.

[0090] As the thickness of the multifilament yarn constituting the yarn for the loop-shaped engaging element, a multifilament yarn made of 6 to 12 filaments and having a total decitex of 250 to 380 decitex is preferable, and a multifilament yarn made of 7 to 10 filaments and having a total decitex of 280 to 350 decitex is particularly preferable. Further, similar to the warp yarn, the multifilament yarn for the loop-shaped engaging element is required to be heat-shrunk under conditions for fusing the heat-fusible multifilament yarn of the weft yarn.

[0091] As described above, steps 1 to 6 are performed in this order, the woven-fabric hook-and-loop fastener is produced from the above-described warp yarn, weft yarn, and monofilament yarn for the hook-shaped engaging element or multifilament yarn for the loop-shaped engaging element.

[0092] First, step 1, that is, a step of weaving a base fabric for the hook-and-loop fastener which is a base fabric in

which the yarn for the engaging element is woven in parallel to warp yarn, and in which a large number of loops for engaging elements formed of the yarn for the engaging element and rising from the front face of the base fabric are present on the front face side of the base fabric, is performed.

[0093] The step is described in detail. The woven structure of the woven-fabric is preferably a plain weave obtained by using a monofilament yarn for the hook-shaped engaging element and a multifilament yarn for the loop-shaped engaging element as a part of the warp yarn. It is preferable that in woven structures in which these yarn for the engaging elements are woven in parallel into the warp yarn, rise up from the front face of the woven base fabric in the middle of the structure, and in the case of the hook-shaped engaging element, run over one to three threads of the warp yarn and crawl in between the warp yarns while forming a loop in the case of the hook-shaped engaging element, on the other hand, in the case of a loop-shaped engaging element, a loop is formed without running over the warp yarn or at a position at which one thread of the warp yarn is run over and the loop for the engaging element is present in parallel to the warp yarn, one leg side part of the loop for the hook engaging element is easily cut in an efficient manner, and further, the hook-shaped engaging element and the loop-shaped engaging element are easily engaged.

[0094] Further, the warp yarn preferably has a weave density after the heat treatment of 35 to 80/cm and the weft yarn preferably has a weave density after the heat treatment of 12 to 30/cm. Further, the mass percentage of the weft yarn is preferably 15 to 40% with respect to the total weight of the yarn for the hook-shaped engaging element, the yarn for the loop-shaped engaging element, the warp yarn, and the weft yarn constituting the hook-and-loop fastener.

[0095] Further, in the hook-and-loop fastener of the present invention, the height of the hook-shaped engaging element is preferably 1.2 to 1.8 mm from the face of the woven base fabric, and the height of the loop-shaped engaging element is preferably 1.9 to 3.0 mm from the face of the woven base fabric, from the viewpoint of engaging force, and further from the viewpoint of the difficulty in falling of the engaging element.

[0096] Further, the density of the hook-shaped engaging element in the hook hook-and-loop fastener, the density of the loop-shaped engaging element in the loop hook-and-loop fastener, and the total density of the hook-shaped engaging element and the loop-shaped engaging element in the hook-and-loop coexisting type hook-and-loop fastener are preferably 30 to 70/cm², 30 to 70/cm², and 60 to 100/cm², respectively, on the basis of the portion of the woven base fabric on which the engaging element is present and on the basis of the area after heat shrinkage. Further, in the hook-and-loop coexisting type hook-and-loop fastener, the ratio of the number of hook-shaped engaging element to the number of loop-shaped engaging element is preferably in the range of 40:60 to 60:40.

[0097] In addition, the number of the monofilament yarns for the hook-shaped engaging element to be threaded into the hook hook-and-loop fastener or the number of the multifilament yarns for the loop-shaped engaging element to be threaded into the loop hook-and-loop fastener is preferably about 2 to 8 threads with respect to 20 threads of warp yarns (including the monofilament yarns for the hook-

shaped engaging element or the multifilament yarns for the loop-shaped engaging element).

[0098] In the case of the hook-and-loop coexisting type hook-and-loop fastener, in the total of the monofilament yarns for the hook-shaped engaging element and the multifilament yarns for the loop-shaped engaging element, about 2 to 8 threads with respect to 20 threads of warp yarns (including the monofilament yarns for the hook-shaped engaging element and the multifilament yarns for the loop-shaped engaging element) is preferable. Further, the ratio of the number of threads between the monofilament yarns for the hook-shaped engaging element and the multifilament yarns for the loop-shaped engaging element is preferably in the range of 40:60 to 60:40.

[0099] Note that when the loop for the hook-shaped engaging element or the loop for the loop-shaped engaging element is formed, in order to facilitate the formation of the loop, a method can be used in which a plurality of metal rods are arranged and placed on the woven base fabric in parallel to the the warp yarns, the yarns for the engaging elements are passed over the upper part of the metal rods to form the loops, and the metal rods are pulled out from the loops after the loops are formed.

[0100] Next, the woven-fabric for the hook-and-loop fastener thus obtained is sent to the step 2, that is, the step of guiding the base fabric to a heating region and heating at a temperature equal to or higher than a temperature at which the heat-fusible component is melted, heat-shrinking the yarn constituting the base fabric and allowing the melt from the heat-fusible yarn to penetrate into the base fabric. In this step, a heat treatment for melting the heat-fusible component of the core-sheath type polyester-based multifilament yarn is performed. Preferably, as shown in FIG. 3, the heat treatment is performed by continuously running in a heat treatment furnace (9) in a long state without winding in the middle.

[0101] By the heat treatment, while melting the sheath component of the sheath-core type heat-fusible multifilament yarn constituting the weft yarn and penetrating the melt into the base fabric, the warp yarn, the yarn for engaging element, and the weft yarn are heat-shrunk to fix to the woven base fabric by strongly tightening the base of the loop made of the monofilament yarn or the multifilament yarn for the engaging element. Further, it is preferable that the long woven-fabric for the hook-and-loop fastener running in the heat treatment furnace is allowed to run without applying much tensile force so as to allow sufficient shrinkage.

[0102] By this, an application of the back coating adhesive and a solvent drying treatment, which have been performed in conventional the woven-fabric hook-and-loop fastener, are not necessary, and a problem in the process and a problem of properties in which the flexibility of the hook-and-loop fastener is impaired due to the back coating adhesive can be prevented. Further, the loop shape of the hook-shaped engaging element is fixed by heat at the time of the heat treatment, and even after one leg of the loop for the hook-shaped engaging element is cut to form the hook-shaped engaging element in the subsequent step 4, the hook shape is maintained and sufficient engagement strength can be obtained. Also, in the case of the loop-shaped engaging element, the loop shape becomes a natural and unified shape.

[0103] The heat treatment temperature of the step 2 used is a temperature at which the heat-fusible component con-

stituting the weft yarn is melted or softened but other components or yarns are not melted, and at which the monofilament yarn for the hook-shaped engaging element is shape-fixed in a loop shape, which is generally 150 to 220° C., more preferably in the range of 185 to 215° C., and further more preferably in the range of 190 to 210° C. Such a heat treatment is usually performed by running the woven-fabric for the hook-and-loop fastener in a heated furnace. Specifically, the heat treatment is completed by running so as to stay in the heating furnace for 20 to 120 seconds at a speed of 0.30 to 1.30 m/minute.

[0104] Next, the thus heat-treated base fabric for the hook-and-loop fastener is subjected to the above-described step 3, that is, a step of taking out the base fabric from the heating region in the above-described step 2 and pressing the rear face of the base fabric against a fixed surface or a roll surface in a state where the heat-fusible component is melted. A preferable method for performing the step 3 is shown in FIG. 3. By performing this step, it is possible to solve the waving shape in the up-and-down direction of the hook-and-loop fastener base fabric generated in the heat treatment step 2, to obtain a smooth front face of the base fabric, and to further prevent the engaging element from being pulled out from the woven base fabric due to the repetition of the engagement and peeling.

[0105] That is, as shown in FIG. 3, when the woven-fabric for the hook-and-loop fastener subjected to the heat treatment in the step 2 comes out from the heat treatment furnace (9), the rear face of the woven base fabric (5) is pressed against a fixed surface or a roll surface (10) in a state in which the heat-fusible component is kept molten. FIG. 3 shows a case where the rear face of the woven base fabric for the hook-and-loop fastener (5) is pressed against the fixed surface (10) immediately after leaving the heat treatment furnace (9).

[0106] By this step 3, the waving in the up-and-down direction of the hook-and-loop fastener can be solved, and as a result, a hook-and-loop fastener with almost no waving can be obtained. When the engaging element existing on the area for the selvage part is cut and removed, the base part of the engaging element can be surely cut. Further, by this step, the engaging element can be further prevented from being pulled out from the base fabric even when the engagement and peeling are repeated. That is, by this step, the yarns constituting the base fabric are pressure-bonded to each other, and the heat-fusible component extruded by the pressure-bonding penetrates into the adjacent yarn to further increase the bonding force, so that the engaging element is firmly fixed to the base fabric, whereby the engaging element can be prevented from being pulled out from the base fabric.

[0107] In particular, in the present invention, when the step 3 is performed by a method of sliding the base fabric on the fixed surface or the roll surface while pressing against the surface, the effects of solving the waving and improving the pull-out resistance of the engaging element can be further exhibited.

[0108] That is, it is preferable to satisfy all of pressing the rear face of the base fabric against the fixed surface or the roll surface, preventing the loop for engaging element existing on a face opposite to the face to be pressed from being pushed down by the operation, and further, sliding the

running base fabric on the fixed surface or the roll surface rolling at a surface speed different from the running speed of the base fabric.

[0109] In this way, the filaments constituting the warp yarn are promoted to move to a stable position by running on the fixed surface or the roll surface while sliding on and being pressed against on the fixed surface or the roll surface, and accordingly, the weft yarn settles to a natural state and a shrinkage state is uniformized. As a result, the strain of the base fabric is solved and the squeezing out of the heat-fusible component from the weft yarn is promoted.

[0110] Then, by pressing it against such a fixed surface or roll surface, the thickness of the warp yarn in the base fabric width direction, which alternately runs over and under the weft yarn with the weft yarn interposed therebetween, at the position at which the warp yarn subducts most toward the rear face side, satisfies 0.94 times or less of the thickness thereof at the position at which the warp yarn floats most toward the front face side, which is described later.

[0111] Furthermore, in the present invention, as described later, it is preferable to set the tensile force applied to the base fabric to about 50 to 600 g/cm while changing the running direction of the loop woven-fabric after contacting with the fixed surface or the roll surface. More preferably, a tensile force of about 100 to 400 g/cm is applied. In addition, further preferably, the step 3 is performed by a method of changing the running direction while pressing the loop woven-fabric against the fixed surface and sliding it on the surface, and by changing the running direction, pressing it against the fixed surface or the roll surface is easily performed and the effect of pressing and sliding is improved.

[0112] Further, the step 3 is preferably carried out at the time when the base fabric is still kept in a high-temperature state by the heat applied in the step 2, that is, by utilizing the residual heat of the step 2, following the step 2, without once cooling the base fabric taken out from the step 2. Even when the base fabric coming out from the step 2 is once cooled and then reheated, the strain of the base fabric is hardly solved and the effect of the present invention is hardly sufficiently obtained. Therefore, step 3 is preferably carried out immediately in the vicinity of the place where step 2 has been carried out, in a state where the woven-fabric for the hook-and-loop fastener come out from step 2 is kept in a heated state by heating.

[0113] Further, it is preferable that, until the rear face of the woven-fabric for the hook-and-loop fastener sent to this step is pressed against the fixed surface or the roll surface after entering heat treatment furnace, the front face and the rear face thereof do not bring in contact with any solid object such as a roller or a guide, and the fixed surface or the roll surface is the first contact object.

[0114] In the present invention, as the fixed surface or the roll surface used in the step 3, a surface having a contact length with the rear face of the base fabric of 20 to 100 mm and a contact time of 2 to 10 seconds is preferable, and specific examples of the surface include a fixed surface or a roll surface made of metals, ceramics, or heat-resistant resins, as preferable materials. The surface of the fixed surface or the roll surface can be a mirror-finished state, a satin-finished state, or slightly uneven as long as the rear face of the loop woven-fabric can be pressed and the rear face of the loop woven-fabric can be slid. Further, a difference of running speed at the time of sliding on the fixed surface (in the case of the fixed surface, the speed of running

thereon, and in the case of the roll surface, the difference between the running speed of the loop woven-fabric running thereon and the surface speed of the roll surface) is preferably 4 to 30 mm/second.

[0115] In addition, as shown in FIG. 3, it is preferable that the rear face of the woven-fabric has a shape in which the running direction is changed by 30 to 180° along the fixed surface, since the effect is particularly easily obtained. In FIG. 3, the woven-fabric for the hook-and-loop fastener (1) changes its running method by 90° along the fixed surface (4). Note that the fixed surface or the roll surface is preferably heated to a temperature lower than the heat treatment temperature by 80 to 100° C. in order to enhance the contact effect. However, in general, the surface of the fixed surface or the roll surface can be heated by residual heat of the base fabric coming out from the heat treatment furnace.

[0116] The surface against which the rear face of the base fabric is pressed can be a surface in which the surface is fixed, a roll surface whose contact surface rolls at a surface speed different from the speed of the base fabric as the base fabric runs, or a roll surface with drive which actively pulls the base fabric and rolls at the surface speed different from the speed of the base fabric. However, in the case of the roll surface, as described above, since it is preferable difference is provided between the surface speed of the roll and the running speed of the loop woven-fabric running while being pressed against the surface to slide the rear face of the loop woven-fabric on the roll surface, the apparatus is complicated. Therefore, in the present invention, the structure is simple and the effect is surely easily obtained, thus, the fixed surface as shown in FIG. 3 is preferably used. Further, the fixed surface can also be a guide-shaped narrow surface, but is preferably a fixed surface having a contact length as described above.

[0117] In the present invention, as shown in FIG. 3, it is preferable that the woven base fabric (5) runs and is passed through the heat treatment furnace (9), the warp yarn, the weft yarn, and the yarn for the engaging element are shrunk by the heat treatment furnace (9) as described above, then it comes out from the heat treatment furnace (9), and it continuously run on the fixed surface or the roll surface (10), whereby the woven base fabric (5) is in a tensioned state in the warp yarn direction at the time of press-bonding to the fixed surface or the roll surface (10). Preferably, a tensile force of about 50 to 600 g/cm is applied to the woven base fabric immediately after the woven base fabric passes through the fixed surface or the roll surface (10). More preferably, a tensile force of about 100 to 400 g/cm is applied.

[0118] In the case of the woven-fabric-based hook-and-loop fastener of the present invention, the warp yarn alternately runs over and under the weft yarn with the weft yarn interposed therebetween, and thus, the rear face of the woven base fabric is in the state covered by the warp yarn, and the weft yarn in which the heat-fusible component is present is hardly brought in direct contact with the fixed surface or the roll surface. Thus, the melt of the heat-fusible component does not adhere directly to the surface of the fixed surface or the roll surface, whereby the occurrence of the trouble is hardly caused.

[0119] By performing the operation [step 3] of pressing the rear face of the woven base fabric (5) against the fixed surface or the roll surface (10) in a state where the heat-fusible component is melted, as shown in FIG. 4, it is

necessary that the thickness of the warp yarn (6) in the base fabric thickness direction at the position at which the warp yarn, which alternately runs over and under the weft yarn with the weft yarn interposed therebetween, subducts most toward a rear face side (hereinafter, sometimes referred to as Tb) is 0.94 times or less of the thickness thereof at the position at which the warp yarn floats most toward a front face side (hereinafter, sometimes referred to as Ts).

[0120] In particular, in the present invention, it is preferable to satisfy that the thickness of the warp yarn, which alternately runs over and under the weft yarn with the weft yarn interposed therebetween, in the base fabric thickness direction at the the position at which the warp yarn subducts most toward the rear face side is 0.94 times or less, and preferably 0.90 times or less, of the thickness thereof at the position at which the warp yarn floats most toward the front face side, not only by sliding on and pressing it against the fixed surface, as described above, but also by running and sliding it on the fixed surface while pressing it against the fixed surface, and changing the running direction. Note that, in FIGS. 2 and 3, K indicates the base fabric thickness direction.

[0121] However, when (Tb) is too low, the rear face of the hook-and-loop fastener base fabric is densely flattened by heat-fusion, and the flexibility and texture, which are advantages of the woven-fabric, and further, the air permeability and liquid permeability are impaired, which is not preferable. Therefore, (Tb) is preferably 0.7 times or more, and particularly preferably 0.75 times or more, of (Ts).

[0122] FIG. 4 schematically shows a cross-sectional state of the woven-fabric hook-and-loop fastener where the effect of the present invention can be obtained by performing an operation of pressing the rear face of the woven base fabric (5) against the fixed surface or the roll surface (10) in a state where the heat-fusible component is melted, that is, the case where (Tb) is 0.94 times or less of (Ts).

[0123] On the other hand, FIG. 5 is a view schematically showing the cross-sectional state of the woven-fabric hook-and-loop fastener when the operation of pressing the rear face of the woven base fabric (5) against the fixed surface or the roll surface (10) in a state where the heat-fusible component is melted is not performed. In this case, (Tb) has substantially the same value as (Ts), and the above-described (Tb) being 0.94 times or less of (Ts) is not satisfied.

[0124] Note that, even when the operation of pressing the rear face of the woven base fabric (5) on the fixed surface or the roll surface (10) in a state where the heat-fusible component is melted, that is, [step 3], is not performed, a phenomenon in which the value of (Tb) becomes slightly smaller than the value of (Ts) due to the natural gravity applied on the hook-and-loop fastener during the manufacturing process of the hook-and-loop fastener woven-fabric can occur. However, the decrease is extremely slight, and (Tb) does not fall below 0.96 times (Ts), therefore, (Tb) is not 0.94 times or less of (Ts).

[0125] Next, a method for measuring (Tb) and (Ts) of warp yarn (6), which alternately runs over and under the weft yarn (7) with the weft yarn interposed therebetween, is described.

[0126] First, an area on the front face on which the engaging element is present and which is less affected by the engaging element is selected, and the hook-and-loop fastener is cut in parallel to the warp yarn so as to cut the central part of the bulge of the warp yarn using a safety razor blade

for shaving as a cutting apparatus. The resulting cross section is photographed with 200 times magnification. FIG. 4 schematically shows a photograph of the cut part obtained as a result.

[0127] From this photograph, three points where the warp yarn subducts most toward the rear face side are arbitrarily selected, three points where the warp yarn floats most toward the front face side are also arbitrarily selected, and the thicknesses in the base fabric direction at the respective points is measured. The same measurement is performed at arbitrary 10 points of the hook-and-loop fastener, and the thicknesses in the base fabric thickness direction at the respective points is measured. Among the 30 measured values of the thicknesses in the base fabric thickness direction at the point where the warp yarn subducts most toward the rear face side and the 30 measured values of the thicknesses in the base fabric thickness direction at the point where the warp yarn floats most toward the front face side, 5 measured values in order from the highest value and 5 measured values in order from the lowest value are removed, and the average value of the remaining 20 values is obtained. The obtained average values are each the thickness (Tb) of the warp yarn in the base fabric thickness direction at the position where the warp yarn subducts most toward the rear face side and the thickness (Ts) of the warp yarn in the base fabric thickness direction at the position where the warp yarn floats most toward the front face side.

[0128] Note that even when the hook-and-loop fastener woven base fabric (5) is pressed against the fixed surface or the roll surface (10) at the time when the heat-fusible component of the weft yarn is kept in a molten state, not all the positions of the warp yarn (6) present on the rear face of the hook-and-loop fastener woven-fabric, which is subducted most toward a rear face side, are pressed against the fixed surface or the roll surface (10). Among these, there sometimes exists a position where the thickness (Tb) of the rear face side of the warp yarn (6) is hardly different from the thickness (Ts) of the front face side without being pressed against the fixed surface or the roll surface (10). However, in the present invention, such a position is also included in the arbitrarily selected positions. Therefore, it can be said that the multiple of (Tb) to (Ts) specified in the present invention (hereinafter, referred to as (Tb)/(Ts) ratio, simply (Tb)/(Ts), or ratio of (Tb) to (Ts) in some cases) is an average value obtained including these points.

[0129] On the other hand, FIG. 5 is a view in the case where the hook-and-loop fastener woven base fabric (5) is not pressed against the fixed surface or the roll surface (10) as described above. In the case of FIG. 5, that is, in the case where (Tb) and (Ts) are substantially the same value, the effect obtained by using the step 3, that is, the effect of eliminating the waving of the hook-and-loop fastener in the up-and-down direction and the effect of highly preventing the engaging element from being pulled out from the woven base fabric by the repetition of the engagement and peeling, cannot be obtained.

[0130] In the present invention, the ratio of (Tb) to (Ts) depends mainly on the pressing strength at the time of pressing the hook-and-loop fastener base fabric against the fixed surface or the roll surface, and therefore the value can be freely changed by the pulling force of the base fabric, the degree of changing the running direction, the temperature of the basic fabric or the like at the time of running the hook-and-loop fastener base fabric on the fixed surface or

the roll surface in a state with the tensile force applied, and preferably by sliding it on the surface while pressing the base fabric against the surface, and further, as shown in FIG. 1, changing the running direction along the fixed surface or the roll surface.

[0131] Note that, in the present invention, it is preferable that, when the rear face of the hook-and-loop fastener woven base fabric (5) is pressed against the fixed surface or the roll surface (10) at the time when the heat-fusible component constituting the weft yarn is kept in a molten state, the front face side of the hook-and-loop fastener woven base fabric (5) where the loop for the engaging element of the hook-and-loop fastener is present is not pressed against the fixed surface or the roll surface (10). That is, when an operation that the hook-and-loop fastener woven base fabric (5) is sandwiched between rolls and the hook-and-loop fastener base fabric is pressed from above and below is performed, the loop for engaging element standing upright on the front face of the woven base fabric is pushed down by the pressing from above and fixed to the front face of the woven base fabric in this state, so that the engaging ability as the hook-and-loop fastener is reduced and the appearance of the hook-and-loop fastener is also deteriorated. Further, when both of the front face side and the rear face side of the hook-and-loop fastener woven base fabric are pressed against the fixed surface or the roll surface (10), (Tb) and (Ts) become substantially equal to each other, and the (Tb)/(Ts) ratio defined in the present invention cannot satisfy 0.94 or less.

[0132] Next, the thus-obtained woven-fabric having the loop for the hook-shaped engaging element on the front face is sent to step 4, that is, a step of cutting one leg of the loop to form a hook-shaped engaging element and to cut a one side part of the loop for the hook-shaped engaging element in the case where the loop for engaging element existing on the front face of the base fabric is a loop for a hook-shaped engaging element, after the base fabric is cooled. Of course, in the case where the loop for the engaging element is a loop-shaped engaging element, it is not necessary to cut a one side part.

[0133] The cutting apparatus used is preferably a cutting apparatus having a structure for cutting one leg of the loop for the hook-shaped engaging element of the woven base fabric for the hook hook-and-loop fastener or the woven base fabric for the hook-and-loop coexisting type hook-and-loop fastener running in the warp yarn direction by reciprocating motion of a movable cutting blade between two fixed blades. The woven-fabric in which the one leg of the loop for the hook-shaped engaging element is cut is used as a hook hook-and-loop fastener or a hook-and-loop coexisting type hook-and-loop fastener.

[0134] It is preferable to continuously perform the above steps 1 to 4 without winding in the middle from the viewpoint of efficiency of production. In the case of the conventional method of applying the back coating resin liquid to the rear face, the speed of drying the applied back coating resin liquid is largely different from the speed of weaving the hook-and-loop fastener, and it is necessary to insert a dyeing step in the middle, so that it is impossible to continuously perform from the weaving step to the one leg cutting step. However, in the case of the present invention, since each step can be performed at almost the same speed, the winding operation in the middle is not required, and the step can be rationalized.

[0135] The wide hook-and-loop fastener tape produced by the above steps 1 to 4 is then sent to step 5, that is, a step of continuously forming the area for the selvage part in which the engaging element is not present and the engaging element area in the warp yarn direction of the base fabric by removing the engaging element by continuously cutting the vicinity of the base of the engaging element in the warp yarn direction of the base fabric at a predetermined interval in the warp yarn direction of the base fabric. By this step, as shown in FIG. 2, a wide hook-and-loop fastener tape (1) is obtained in which an area where the engaging element is not present (that is, the area for the selvage part: 3*b*) and an area where engaging element is present (the engaging element area: 4) are alternately present at a predetermined interval in the weft yarn direction (We direction) of the base fabric, and these areas are continuous in the warp yarn direction (Wa direction).

[0136] The area for the selvage part (3*b*) is formed by clipping all the engaging elements in the area in the warp yarn direction so as to have a width of about 2 to 20 mm, particularly about 4 to 10 mm, on each of both sides of the engaging element area (4) having a width of 12 to 100 mm. FIG. 1 is a perspective view schematically showing an example of a hook-and-loop fastener having selvage parts according to the present invention, and FIG. 2 shows a wide state before being divided to the hook-and-loop fasteners as shown in FIG. 1 (that is, a state before the step 6). In these figures, 4 is an engaging element area, 3 is a selvage part, and 3*b* is an area for a selvage part. We represents a width direction (weft yarn direction), Wa represents a length direction (warp yarn direction), and 7 represents an engaging element.

[0137] Both the engaging element area (4) and the area for the selvage part (3*b*) are usually continuous in the length direction of the hook-and-loop fastener (warp yarn direction: Wa direction). Next, by a step in which the area for selvage part 3*b* shown in FIG. 2 is cut (slit) at a substantially intermediate part in the width direction to be separated into individual narrow hook-and-loop fastener tapes, that is, by step 6, a hook-and-loop fastener (5) having selvage parts (3) at both end parts as shown in FIG. 1 is obtained.

[0138] It cannot be said unconditionally, because various widths are required depending on the use of the hook-and-loop fastener, but in general, the width of the engaging element area (4) having various widths such as a width of 8 mm, a width of 16 mm, a width of 21 mm, a width of 26 mm, a width of 30 mm, a width of 36 mm, a width of 45 mm, a width of 95 mm and the like are used. Further, the width of the wide hook-and-loop fastener before being divided into the narrow hook-and-loop fastener is preferably 50 to 300 mm, particularly preferably 100 to 200 mm, and is preferably width that is enough to be divided into 2 to 10 narrow hook-and-loop fasteners. Furthermore, the width of the selvage part is preferably 1.5 to 4 mm.

[0139] A clipping apparatus used for forming the area for the selvage part is not particularly limited, and an ordinary clipping apparatus used for cutting and arranging nap on the front face of the woven-fabric can be used.

[0140] For example, there is a clipping apparatus as described in the above-described PTL 1, specifically, an apparatus having a structure in which a hook-and-loop fastener tape is transferred in a longitudinal direction while engaging elements are continuously clipped and cut by a disc-shaped rotary blade in which several cutting blades are

pruned off on a circumference. Further, when the engaging element is clipped by the disc-shaped rotary blade, as shown in FIG. 3 of PTL 1, it is preferable to use a method in which the hook-and-loop fastener tape is transferred while being folded, and the engaging element is clipped at the folded position by using both the rotary blade and a fixed clipping blade, because the cutting position of the engaging elements is stabilized.

[0141] Note that the clipping treatment of the engaging element for forming the area for the selvage part is performed twice or more, and at least once after the second time, a method of applying the cutting blade to the engaging element from a direction opposite to the direction in which the cutting blade is applied to the engaging elements at the first time can be used.

[0142] By carrying out the above-described step 5, at least one area for the selvage part (3*b*) is formed in the width direction, and as shown in FIG. 2, a wide hook-and-loop fastener tape having the selvage part—(the engaging element area—the area for the selvage part)_{*n*}—the engaging element area—the selvage part is obtained (the above-described *n* is an integer of 1 or more).

[0143] Note that with regard to the width of the engaging element area (4), a plurality of widths thereof can coexist in a tape for the wide hook-and-loop fastener, and in order to produce a hook-and-loop fastener without loss, it is preferable to combine various widths as much as possible.

[0144] The thus-obtained wide hook-and-loop fastener tape (1) having the area for the selvage parts (3*b*) is then sent to step 6, that is, a step of cutting the area for the selvage part (3*b*) at a substantially intermediate part in the width direction to form selvage parts (3) from the area, whereby a plurality of long polyester-based woven-fabric hook-and-loop fastener (2) having the selvage parts (3) at both ends in the weft yarn direction (We) as shown in FIG. 1 is obtained. The cutting is generally performed by a method of cutting by pressing the intermediate part of the area for the selvage part against a fixed or rotating blade, but other methods can be used.

[0145] Then, in order to prevent fraying from the selvage-part-end part caused by cutting, the yarn at the selvage-part-end part can be lightly heat-fused, or the front face of the selvage part can be lightly heat-fusion-treated so that the stump of the selvage part does not impair the touch feeling, and this heat-fusion treatment can be performed before step 6.

[0146] As described above, the hook-and-loop fastener produced by the above method satisfies the following constitutions (1) and (2).

[0147] (1) a thickness of the warp yarn in a base fabric thickness direction at a position at which the warp yarn, which alternately runs over and under the weft yarn with the weft yarn interposed therebetween, subducts most toward a rear face side is 0.94 times or less of a thickness thereof at a position at which the warp yarn floats most toward the front face side;

[0148] (2) at least one selvage part of the selvage parts existing at both end parts is formed by cutting and removing a base part of the engaging element.

[0149] The above-described constitution (1) is generated by the step 3 as described above, and by this constitution, the hook-and-loop fastener is extremely rarely in a waving state in the up-and-down direction, and when the area for the selvage part is formed in the step 5, the hook-and-loop

fastener having selvage parts uniformly clipped such that the engaging elements become stumps having a uniform height in the vicinity of the bases of the engaging elements is obtained, and further, the pull-out resistance of the engaging element is largely improved. Further, according to the above construction (2), since at least one of the selvage parts is formed by clipping the engaging element, it is possible to solve the problems of the prior art that a large number of facilities for weaving and beam stocks of the warp yarn and the yarn for the engaging element are required, a large amount of labor and time are required for changing the tape widths, and further, the stocks in the middle of the process is increased.

[0150] In the constitution (2), “at least one selvage part of the selvage parts existing at both end parts is formed by cutting and removing a base part of the engaging element” is specified, but the reason why at least one selvage part is used is that a selvage part (outer selvage part: **3a**) in which the engaging element does not exist normally exists at both end parts of the wide woven-fabric for the hook-and-loop fastener (**1** shown in FIG. **2**) before being divided into the narrow hook-and-loop fastener, and therefore, a case where such a selvage part (**3a**) is used as one selvage part is considered.

[0151] In the hook-and-loop fastener of the present invention, it is preferable that the pull-out force of the engaging element from the base fabric is 5.5 N or more, and in the present invention, an extremely high value is achieved for the pull-out force of the engaging element from the base fabric because all the hook-and-loop fastener constituent yarns are heat-shrinkable yarns, the base of the engaging element is tightened by them, the base of the engaging element is fixed by fusion of the melted resin from the heat-fusible component constituting the weft yarn, and because of the operation in which the rear face of the woven base fabric (**5**) is pressed against the fixed surface or the roll surface (**10**) in a state where the heat-fusible component is molten.

[0152] Note that, as for the method of measuring the pull-out force of the engaging element, a tensile tester manufactured by SHIMADZU Corporation was used, the hook-and-loop fastener was folded in the width direction (weft yarn direction) so that the hook-shaped engaging element could be easily grasped and set in a chuck of the tensile tester, one hook-shaped engaging element of the set hook-and-loop fastener was grasped with pliers, the hook-shaped engaging element was pulled out from the base fabric at a tensile speed of 100 mm/min, and at that time, the maximum strength when the hook engaging element was pulled out from the base fabric of the hook-and-loop fastener was measured for the pull-out force of the engaging element described herein. In the case of the loop hook-and-loop fastener, the yarn for the loop-shaped engaging element of the loop to be measured which subducts toward the base fabric and then floats toward the front face of the base fabric is cut at the top part of the front face of the base fabric, whereby a value is measured by the above method in this state. Further, in the case of the hook-and-loop coexisting type hook-and-loop fastener, the value of the pull-out force of the hook-shaped engaging element is used as the pull-out force of the engaging element. Ten of them were randomly selected, their pull-out forces were measured, and their average value was adopted.

[0153] The polyester-based woven-fabric hook-and-loop fastener thus obtained is preferably dyed. The dyeing is carried out by high-temperature and high-pressure dyeing using a disperse dye, which is employed in dyeing of polyester-based fiber products. That is, the hook-and-loop fastener of the present invention is wound into a roll shape in a long state, specifically, the following method is performed: the hook-and-loop fastener having a length of 50 to 300 m is wound into a roll shape, the roll shaped product is placed on a partition plate, a plurality of the partition plates on which the roll shaped products are placed are stacked on the up-and-down direction and inserted into a dyeing vessel, and a dye liquid is circulated in the vessel to bring the hook-and-loop fastener into contact with the dye liquid.

[0154] Specific dyeing conditions are, for example, dyeing at about 120 to 140° C. and for about 20 to 120 minutes. The type of the disperse dye used for dyeing is not particularly limited, and any disperse dye conventionally used for dyeing polyester fibers can be used. Examples of the disperse dye include nitro-based, styryl-based, and methine-based in addition to monoazo-based, diazo-based, and anthraquinone-based.

[0155] Since the hook-and-loop fastener of the present invention does not form a waving in the up-and-down direction, when wound into a roll shape, a wound product (roll-shaped product) having a uniform interval between the hook-and-loop fastener and the surrounding hook-and-loop fastener, that is, a uniform interval between the overlapping hook-and-loop fasteners, can be obtained. When the hook-and-loop fastener wound at such a uniform interval is dyed in a wound state, since the interval is uniform, the dyed hook-and-loop fastener that is uniformly brought into contact with the dyeing liquid (that is, the amount of drift of the dyeing liquid is small), and that is uniformly dyed, that is, has less dyeing unevenness, is obtained. Further, the dyeing with a disperse dye is carried out at a high temperature and a high pressure for a long period of time as described above, and the hook-and-loop fastener of the present invention has characteristics that a new waving is hardly generated at this time.

[0156] Further, the dyeing can be performed between [step 5] and [step 6] or after [step 6], that is, preferably performed after the step of forming the area for the selvage part where the engaging element is not present. As a result, the stump cut surface of the engaging element present in the selvage part is also dyed, the presence of the stump cut surface becomes inconspicuous, and the selvage parts formed from the outer selvage part (**3a**) and the area for the intermediate selvage part (**3b**) are further less distinguishable from each other in appearance, which is preferable.

[0157] The hook-and-loop fastener obtained by the present invention can be used in the application field in which conventional general woven-fabric hook-and-loop fasteners are used. They can be used in a wide range of fields, such as clothes, shoes, bags, hats, gloves, sphygmomanometers, supporters, binding bands for packing, binding tapes, various toys, fixation of engineering sheets, fixation of various panels and wall materials, fixation of electrical parts, assembly/disassembly storage boxes and packing cases, small articles, and curtains. Particularly, they are suitable for the application fields in which the hook-and-loop fastener is attached to a fabric or sheet by sewing, for example, fields, such as clothes, shoes, bags, hats, gloves, and supporters.

[0158] In particular, it is suitable for polyester-based composite products that are dyed with a disperse dye after a hook-and-loop fastener is attached thereto, and is suitable for applications in which the woven-fabric hook-and-loop fastener of the present invention is attached to the polyester-based composite product by sewing or the like, and then the composite product is dyed with a disperse dye simultaneously with the hook-and-loop fastener.

EXAMPLES

[0159] The present invention is described more specifically below with reference to Examples. Note that, in Examples, the engaging force of a hook-and-loop fastener was measured according to JIS L 3416-2000. As a hook-and-loop fastener as an object to be engaged at that time, when a hook-and-loop fastener of Examples and Comparative Examples was a loop hook-and-loop fastener, a hook hook-and-loop fastener A8693Y (manufactured by Kuraray Fastening Co., Ltd.) was used, when a hook-and-loop fastener of Examples and Comparative Examples was a book hook-and-loop fastener, a loop hook-and-loop fastener B2790Y (manufactured by Kuraray Fastening Co., Ltd.) was used, and when a hook-and-loop fastener of Examples and Comparative Examples was a hook-and-loop coexisting type hook-and-loop fastener, the same hook-and-loop coexisting type hook-and-loop fastener was used.

Example 1

[Production of Loop Hook-and-Loop Fastener]

[0160] The following yarns were prepared as a warp yarn, a weft yarn and a multifilament yarn for a loop-shaped engaging element constituting the woven base fabric of the loop hook-and-loop fastener.

[Warp Yarn]

- [0161]** Multifilament yarn made of polyethylene terephthalate homopolymer
- [0162]** Total decitex and number of filaments: 36 of 167 dtex
- [0163]** Dry heat shrinkage at 180° C.: 15%

[Weft Yarn (Multifilament Based Heat-Fusible Yarn Made of Core-Sheath Type Composite Fiber)]

- [0164]** Core component: polyethylene terephthalate homopolymer
- [0165]** Sheath component: isophthalic acid 25 mol % copolymerized polyethylene terephthalate (Softening point: 190° C.)
- [0166]** Core-sheath ratio (weight ratio): 70:30
- [0167]** Total decitex and number of filaments: 48 of 240 dtex
- [0168]** Dry heat shrinkage at 180° C.: 14%

[Multifilament Yarn for Loop-Shaped Engaging Element]

- [0169]** Multifilament yarn made of polybutylene terephthalate containing 5% by weight of polytrimethylene terephthalate
- [0170]** Total decitex and number of filaments: 8 of 305 dtex
- [0171]** Dry heat shrinkage at 180° C.: 13%

[Production of Loop Hook-and-Loop Fastener]

[0172] The above described warp yarn, the weft yarn and the multifilament yarn for the loop-shaped engaging element were used, a plain weave was used as the woven structure, and the multifilament yarn for the loop-shaped engaging element was threaded into the warp yarn in parallel at a ratio of one thread to four threads of warp yarn without running over the warp yarn so as to have the weaving density (after heat shrinkage treatment) of 56 threads of warp yarn/cm and 21 threads of weft yarn/cm, and so as to form a loop after alternately running over and under five threads of the weft yarn, and then a loop was formed on the woven base fabric.

[0173] Then, a tape for a loop hook-and-loop fastener was woven in which an area for an outer selvage having a width of 6.5 mm where the multifilament yarn for the loop-shaped engaging element was not woven into at one end, followed by an engaging element area having a width of 108 mm, and an area for an outer selvage having a width of 6.5 mm where the multifilament yarn for the loop-shaped engaging element was not woven into at the opposite side end were formed.

[0174] The tape for the loop hook-and-loop fastener having a width of 12 cm woven under the above conditions was heat-treated at 195° C. at which only the sheath component of the weft yarn was heat-melted and none of the warp yarn, the multifilament yarn for the loop engaging element, and the core component of the weft yarn were heat-melted, by running in a heat treatment furnace in a state that is not in contact with any solid object and in a state in which a tension is hardly applied for 60 seconds, so that the warp yarn, weft yarn, and multifilament yarn for the loop-shaped engaging element were shrunk at the same time when the sheath component of the weft yarn is melted. As a result, the tape was shrunk by about 10% in the weft yarn direction, and the sheath component was melted to fuse the yarn existing in the vicinity.

[0175] With the heat-fusible component still in a molten state, as shown in FIG. 3, the rear face of the hook-and-loop fastener woven-fabric was pressed for 5 seconds against a stainless steel fixed surface of a length of 5 cm having a satin-finished surface placed at the position immediately after the outlet of the heat treatment furnace, and then, along the fixed surface, the rear face of the woven-fabric for the hook-and-loop fastener was pressed against, slid, and run on the surface, and run in a state with a tensile force of 250 g/cm applied after passing through the fixed surface, and then the running direction was changed by 90° in the middle as shown in FIG. 3. The obtained woven-fabric tape was cooled, and the wide tape for the loop hook-and-loop fastener was wound up. Note that the step of weaving the hook-and-loop fastener woven-fabric, the step of heat treatment, and the step of pressing the rear face against the fixed surface were continuously performed without winding in the middle.

[0176] The density of the loop-shaped engaging element in the engaging element area of the obtained woven-fabric tape for the loop hook-and-loop fastener was 45/cm², and the height of the loop-shaped engaging element from the woven base fabric was 2.1 mm. As for the obtained hook-and-loop fastener woven-fabric tape, the loop-shaped engaging elements in the area for the selvage part were clipped at the bases of the engaging elements using the engaging element clipping apparatus as shown in FIG. 3 of PTL 1, that is, an apparatus that uses both a disc-shaped rotary blade having several cutting blades pruned off on the circumfer-

ence and a fixed clipping blade, and that continuously clips the loop-shaped engaging elements at the bases of the engaging elements by the rotary blade and the fixed clipping blade at a position where the loop-shaped engaging element tape is folded and continuously transferred, thereby forming flat parts to be the areas for the selvage part that are continuous in parallel in the tape length (warp yarn) direction with a width of 4 mm at an interval of 21 mm.

[0177] As a result, a wide tape for a loop hook-and-loop fastener having outer selvage parts each with a width of 6 mm at both end parts, and four engaging element areas each with a width of 21 mm and three areas for the selvage parts each with a width of 4 mm alternately therebetween was obtained. Then, the central part of the area for the selvage part was slit, and the outer selvage part was cut into a width of 2 mm to obtain four loop hook-and-loop fastener tapes in which the selvage parts each with a width of 2 mm were present at both end parts of the engaging element area with a width of 21 mm.

[0178] As compared with a loop hook-and-loop fastener made of a conventional nylon-based yarn and coated with a back coating adhesive, this loop hook-and-loop fastener with the selvage parts was excellent in flexibility, no trace of clipping of the engaging elements was found in the selvage part, no shaving off of the hook-and-loop fastener base fabric was found, all the engaging elements were clipped in the vicinity of the bases of the engaging elements and at a height so as to be flush with front face of the base fabric, and the selvage part formed from the outer selvage part and the selvage part formed from the area for the selvage part could hardly be distinguished from each other only by viewing from the front face of the hook-and-loop fastener and touching. In general, in the case of a loop hook-and-loop fastener, it is expected that a large amount of unshaved-off portion is observed since the loop-shaped engaging element is an aggregate of thin filaments, but in the case of this loop hook-and-loop fastener, such portion is not observed at all.

[0179] Further, a thickness (Tb) of the warp yarn in the base fabric thickness direction at a position at which the warp yarn subducts most toward a rear face side and a thickness (Ts) of the warp yarn in the base fabric thickness direction at a position at which the warp yarn floats most toward the front face side, of the loop hook-and-loop fastener were measured. (Tb) was 0.088 mm and (Ts) was 0.105 mm, and therefore, (Tb)/(Ts) was 0.84. Further, the hook-and-loop fastener base fabric layer was completely flat, and no waving in the up-and-down direction, which is often seen in a conventional to the hook-and-loop fastener, was observed.

[0180] The engaging force of this loop hook-and-loop fastener was measured. The initial engaging force was 15.1 N/cm² in shear strength and 1.22 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 14.3 N/cm² in shear strength and 1.15 N/cm in peel strength, and thus it was found that it had an excellent engaging force as a hook-and-loop fastener. The pull-out force of the loop-shaped engaging element of this loop hook-and-loop fastener was 22.1 N, which was high, and even when the engagement and peeling were repeated 1000 times, a portion where the loop-shaped engaging element was pulled out from the base fabric such that the loop protruded long on the front face was not observed at all.

[0181] The obtained loop hook-and-loop fastener was attached by sewing so as to be paired with the hook

hook-and-loop fastener of the following Example 2 in order to use it for opening and closing the cuff of working clothes. The selvage parts were flexible and could be easily attached, and the working clothes were used for a long period of time, but the selvage parts of the hook-and-loop fastener were not frayed due to repeated engagement and peeling or washing, and could be used for a long period of time without impairing the excellent engaging property.

Example 2

[Production of Hook Hook-and-Loop Fastener]

[0182] In the method for producing the loop hook-and-loop fastener of Example 1, the yarn for the engaging element was changed to the following monofilament yarn for the hook-shaped engaging element, a plain weave was used as the woven texture, and weaving was performed so that the weave density (after the heat shrinkage treatment) was 56 threads of warp yarn/cm and 20 threads of weft yarn/cm. Then, the monofilament yarn for the hook-shaped engaging element was threaded into the warp yarn in parallel at a ratio of one thread to four threads of warp yarn, runs over three threads of the warp yarn after alternately running over and under five threads of the weft yarn, so that a loop was formed on the base fabric to form a loop at the running-over position.

[0183] Then, a tape for the hook hook-and-loop fastener was woven, in which the area for the outer selvage having a width of 6.5 mm where the monofilament yarn for the hook-shaped engaging element was not woven into at one end, followed by the engaging element area having a width of 108 mm, and the area for the outer selvage having a width of 6.5 mm where the monofilament yarn for the hook-shaped engaging element was not woven into at the opposite side end were formed.

[Monofilament Yarn for Hook-Shaped Engaging Element]

[0184] Monofilament yarn made of polyethylene terephthalate homopolymer

[0185] Fineness: 305 dtex (diameter: 0.18 mm)

[0186] Dry heat shrinkage at 180° C.: 18%

[0187] The tape for the hook hook-and-loop fastener thus woven was heat-treated by running in a heat treatment furnace for 55 seconds at 210° C. at which only the sheath component of the weft yarn was heat-melted and none of the warp yarn, the yarn for the engaging element and the core component of the weft yarn were heat-melted, in a state where almost no tensile force was applied, to shrink the warp yarn, the weft yarn, and the yarn for the engaging element. The tape was shrunk by 11% in the weft yarn direction, and the sheath component was melted to fuse the yarns existing in the vicinity thereof.

[0188] Further, with the heat-fusible component still in a molten state, in the same manner as in Example 1, along a stainless steel fixed surface having a mirror-finished surface placed in the immediately vicinity of the outlet of the heat treatment furnace, the woven-fabric for the hook-and-loop fastener was slid and run on the surface while the rear face thereof was pressed against, and run in a state with a tensile force of 360 g/cm applied after passing through the fixed surface, the running direction was changed by 90° in the middle as shown in FIG. 3, and the rear face of the

hook-and-loop fastener woven-fabric was pressed against the fixed surface for 5 seconds.

[0189] Then, the obtained woven-fabric for the hook hook-and-loop fastener was cooled, and one leg part of the loop for the hook-shaped engaging element was cut to form a hook-shaped engaging element. Note that the step of weaving the woven-fabric for the hook hook-and-loop fastener, the step of heat treatment, the step of pressing the rear face to the fixed surface and the step of cutting one leg of the loop for the hook-shaped engaging element were continuously and consistently performed without winding in the middle.

[0190] The density of the hook-shaped engaging element in the engaging element area of the obtained hook hook-and-loop fastener was $42/\text{cm}^2$, and the height of the the hook-shaped engaging element from the front face of the base fabric was 1.5 mm.

[0191] Next, in the same manner as in Example 1, flat parts to be the areas for the selvage part that are continuous in the tape length direction with a width of 4 mm were formed at an interval of 21 mm by continuously clipping the bases of the hook-shaped engaging elements using the engaging element clipping apparatus. As a result, a wide tape for a hook hook-and-loop fastener having the selvage parts each with a width of 6 mm at both end parts, and four engaging element areas each with a width of 21 mm and three areas for the selvage parts each with a width of 4 mm alternately therebetween was obtained. Then, the central part of the area for selvage part was slit, and further, the outer selvage part was cut into a width of 2 mm to obtain four hook hook-and-loop fastener tapes in which the selvage parts each with a width of 2 mm were present at both end parts of the engaging element area with a width of 21 mm.

[0192] As in the loop hook-and-loop fastener of Example 1, as compared with a hook hook-and-loop fastener made of a conventional nylon-based yarn and coated with a back coating adhesive, this hook hook-and-loop fastener with the selvage parts was excellent in flexibility and in the selvage part, there were not found any unclipped portions of the engaging elements, any known stumps, and any shaved-off portions of the hook-and-loop fastener base fabric, and all the engaging elements were clipped in the vicinity of the bases of the engaging elements and at a height so as to be flush with the front face of the base fabric, and the selvage part formed from the outer selvage part and the selvage part formed from the area for the selvage part could not be apparently distinguished from each other only from the appearance by viewing from the front face of the hook-and-loop fastener.

[0193] Further, the thickness (T_b) of the warp yarn in the base fabric thickness direction at a position at which the warp yarn subducts most toward the rear face side and the thickness (T_s) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side, of the hook hook-and-loop fastener were measured, the ratio thereof was determined, and (T_b)/(T_s) was 0.89. Further, in this hook hook-and-loop fastener, the base fabric was completely flat, and waving in the up-and-down direction, which was observed in the conventional hook hook-and-loop fastener, was not observed at all.

[0194] The engaging force of this hook hook-and-loop fastener was measured. The initial engaging force was 15.6 N/cm^2 in shear strength and 1.24 N/cm in peel strength, and

the engaging force after 1000 times of engagement and peeling was 14.7 N/cm^2 in shear strength and 1.20 N/cm in peel strength, and it was found that it had an excellent engaging force as a hook hook-and-loop fastener. The pull-out force of the hook-shaped engaging element was 6.3 N, and the hook-shaped engaging element had excellent pull-out resistance. In fact, even when the engagement and peeling were repeated 1000 times, there were not found any traces that the hook-shaped engaging element was pulled out from the base fabric, or there were not found any portions that it was pulled out from the front face of the base fabric and protruded long on the front face.

[0195] In order to use the hook hook-and-loop fastener thus obtained as a hook-and-loop fastener for opening and closing the cuff of working clothes, it was attached by sewing so as to be paired with the loop hook-and-loop fastener of Example 1. The selvage parts of the hook hook-and-loop fastener were flexible and could be easily attached without impairing the texture of the working clothes, and the working clothes were used for a long period of time, but the selvage parts of of the hook-and-loop fastener was not frayed due to repeated engagement and peeling or washing, and could be used comfortably for a long time without impairing the engaging property.

Example 3

[Production of Hook-and-Loop Coexisting Type Hook-and-Loop Fastener]

[0196] Using the warp yarn, the multifilament yarn for the loop-shaped engaging element and the monofilament yarn for the hook-shaped engaging element used in Examples 1 and 2, a hook-and-loop coexisting type hook-and-loop fastener was produced using a core-sheath type multifilament yarn having the same core component and the same number of filaments as those of the weft yarn used in Examples 1 and 2 except that polybutylene terephthalate copolymerized with 25 mol % of isophthalic acid was used as the sheath component, the total decitex was changed to 48 of 220 dtex and the dry-heat shrinkage percentage at 180° C . was changed to 15%, as the weft yarn.

[0197] At this time, a plain weave was used as the woven structure, the weaving density (after heat shrinkage treatment) was 56 threads of warp yarn/cm and 20 threads of weft yarn/cm, and the multifilament yarn for the loop-shaped engaging element or the monofilament yarn for the hook-shaped engaging element was used at a ratio of one thread to four threads of warp yarn, and in the case of the multifilament yarn for the loop-shaped engaging element, after three threads of weft yarn were alternately run over and under, one tread of warp yarn was run over, and then a loop was formed on the base fabric so as to form a loop at the running-over position, and in the case of a monofilament yarn for the hook-shaped engaging element, after three threads of weft yarn were alternately run over and under, three threads of warp yarn were run over, and then a loop was formed on the base fabric so as to form a loop at the running-over position. At this time, the multifilament yarn for the loop-shaped engaging element and the monofilament yarn for the hook-shaped engaging element were alternately woven so as to be each continuously present in a unit of two threads.

[0198] Then, in the same manner as in Example 1 and Example 2, a tape for a hook-and-loop coexisting type

hook-and-loop fastener was woven in which the area for the outer selvage having a width of 6.5 mm where the yarn for the engaging element was not woven into at one end, followed by the engaging element area having a width of 108 mm, and the area for the outer selvage having a width of 6.5 mm where the yarn for the engaging element was not woven into at an end part were formed.

[0199] The tape for the hook-and-loop coexisting type hook-and-loop fastener having a width of 12 cm woven by the above method was heat-treated by running in the heat treatment furnace for 60 seconds at 205° C. at which only the sheath component of the weft yarn was heat-melted and the warp yarn, the yarn for the engaging element, and the core component of the weft yarn were not heat-melted, in a state where almost no tensile force was applied, to shrink the weft yarn, weft yarn, and the yarn for the engaging element. As a result, the tape was shrunk by 11% in the weft yarn direction, and the sheath components were melted to fuse the yarns existing in the vicinity.

[0200] With the heat-fusible component still in a molten state, as in Examples 1 and 2, along the stainless steel fixed surface having a satin finished surface placed at the outlet of the heat treatment furnace, the hook-and-loop fastener woven-fabric was slid and run on the surface while the rear face thereof was pressed against, and run in a state with a tensile force of 280 g/cm applied after passing through the fixed surface, the running direction was changed by 90° in the middle as shown in FIG. 3, and the rear face thereof was pressed against the fixed surface for 5 seconds. The woven-fabric thus obtained was cooled, and one leg part of the loop for the hook-shaped engaging element was cut to form a hook-shaped engaging element.

[0201] In the engaging element area of the obtained hook-and-loop coexisting type hook-and-loop fastener, the density of the hook-shaped engaging element was 32/cm², the density of the loop-shaped engaging element was 32/cm², the height of the hook-shaped engaging element from the front face of the base fabric was 1.6 mm, and the height of the loop-shaped engaging element from the base fabric was 2.0 mm. Note that the step of weaving the hook-and-loop fastener woven-fabric, the step of heat treatment, the step of heat-press bonding the rear face, and the step of cutting one leg of the loop for the hook-shaped engaging element were continuously and consistently performed without winding in the middle.

[0202] Next, in the same manner as in Example 1, flat parts to be the areas for the selvage part that are continuous in the tape length direction with a width of 4 mm were formed at an interval of 21 mm by continuously clipping the bases of the engaging elements using the engaging element clipping apparatus. As a result, a wide tape for the hook-and-loop fastener having the selvage parts each with a width of 6 mm at both end parts, four engaging element areas each with a width of 21 mm and three areas for the selvage parts each with a width of 4 mm alternately therebetween was obtained. The central part of the area for the selvage part of the tape was slit, and further the outer selvage part was cut into a width of 2 mm to obtain four hook-and-loop coexisting type hook-and-loop fastener tapes in which the selvage parts each with a width of 2 mm were present at both end parts of the engaging element area with a width of 21 mm.

[0203] As with the loop hook-and-loop fastener of Example 1 and the hook hook-and-loop fastener of Example

2, as compared with a hook-and-loop coexisting type hook-and-loop fastener made of a conventional nylon-based yarn and coated with a back coating adhesive, this hook-and-loop coexisting type hook-and-loop fastener with the selvage parts was excellent in flexibility, and in the selvage part, there were not found any unclipped portions of the engaging elements, any known stumps, and any shaved-off portions of the hook-and-loop fastener base fabric, and all the engaging elements were clipped in the vicinity of the bases of the engaging elements and at a height so as to be flush with the front face of the base fabric, and the selvage part formed from the outer selvage part and the selvage part formed from the area for the selvage part were hardly distinguished from each other only by viewing from the front face of the hook-and-loop fastener.

[0204] Further, the thickness (T_b) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side and the thickness (T_s) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side, of the hook-and-loop coexisting type hook-and-loop fastener were measured, the ratio thereof was determined, and (T_b)/(T_s) was 0.87. The base fabric of the obtained hook-and-loop fastener was completely flat, and no waving in the up-and-down direction of the base fabric observed in the conventional hook-and-loop fastener was observed.

[0205] The engaging force of this hook-and-loop coexisting type hook-and-loop fastener was measured. The initial engaging force was 11.1 N/cm² in shear strength and 1.05 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 10.0 N/cm² in shear strength and 0.96 N/cm in peel strength, so that it was found that it had an excellent engaging force as a hook-and-loop coexisting type hook-and-loop fastener. The pull-out force of the hook-shaped engaging element was 5.6 N, which was an excellent value, and this could also be confirmed that trace of the hook-shaped engaging element being pulled out from the base fabric or long protrusion on the front face being pulled out from the front face of the base fabric was not observed at all even after 1000 times of repetition of engagement and peeling.

[0206] The obtained hook-and-loop coexisting type hook-and-loop fastener was attached as a fastening tape of a supporter to a supporter cloth by sewing. It could be easily attached because the selvage part was flexible, the flexibility and the wearing feeling of the supporter were not impaired, and further, the selvage part of the hook-and-loop fastener was not frayed due to repeated engagement and peeling or washing, and the supporter could be comfortably used for a long time without impairing the engaging property.

Examples 4 to 6

[0207] Flat parts to be the areas for the selvage parts each having a width of 4 mm were formed in parallel in the tape length direction at an interval of 30 mm by the same methods as in each of Example 1, Example 2, and Example 3, except that, the wide hook-and-loop fastener obtained in each of steps 1 to 4 in Example 1, Example 2, and Example 3, was used, and the interval between the rotary blades for clipping was changed in step 5.

[0208] As a result, three kinds of wide tapes for the hook-and-loop fastener each having the outer selvage parts each with a width of 5 mm at both end parts, and three

engaging element areas each with a width of 30 mm and two areas for the selvage parts each with a width of 4 mm alternately therebetween were obtained. Then, the central part of the area for the selvage part of the hook-and-loop fastener was slit, and the outer selvage part was cut into a width of 2 mm, thereby obtaining three loop hook-and-loop fastener tapes (Example 4), three hook hook-and-loop fastener tapes (Example 5), and three hook-and-loop coexisting type hook-and-loop fastener (Example 6), in each of which the selvage parts each having a width of 2 mm were present at both end parts of the engaging element area having a width of 30 mm.

[0209] The properties of the obtained hook-and-loop fastener (the engaging element pull-out force, $(T_b)/(T_s)$, the engaging force, the presence or absence of the waving in the up-and-down direction of the base fabric, the flexibility, the appearance, the texture, the appearance of the selvage part) and the like were exactly the same as those of Examples 1, 2 and 3, respectively.

[0210] Further, in order to change the brand from the the hook-and-loop fastener having a width of 21 mm of Examples 1 to 3 to the one having a width of 30 mm of the present examples, the width of the hook-and-loop fastener could be easily changed simply by changing the interval between the rotary blades for clipping, and changing the facilities for weaving, changing the beams for the warp yarn and yarn for the engaging element and a large amount of labor and time required for changing the tape width, which had been performed at the production of the conventional hook-and-loop fastener to change the hook-and-loop fastener width, were all unnecessary, and further, the stocks in the middle process was also completely unnecessary.

[0211] Further, in the loop hook-and-loop fastener, the hook hook-and-loop fastener and the hook-and-loop coexisting hook-and-loop fastener, it is very easy to change the width of the hook-and-loop fastener, and after receiving an order, in the hook-and-loop fastener stored in a wide state before forming the area for the selvage part, by continuously clipping the engaging element forming the area for the selvage part at the base thereof, and by slitting the intermediate of the area for the selvage part, immediately, the hook-and-loop fastener having a width corresponding to the order can be obtained very quickly and simply, which is industrially advantageous.

Comparative Example 1

[0212] A loop hook-and-loop fastener having selvage parts was produced in the same manner as in Example 1, except that the operation of running and pressing the woven-fabric for the fastener against along a stainless steel fixed surface having a mirror-finished surface placed in the immediately vicinity of the outlet of the heat treatment furnace with the heat-fusible component still in a molten state, in Example 1, that is, the step 3 was not performed and after heat-treated, the method was replaced with the method of being taken up by a roller after the weft yarn was sufficiently cooled.

[0213] On the selvage part of the loop hook-and-loop fastener with the selvage parts, stumps formed by clipping the engaging elements and protruded from the front face of the selvage part at a portion thereof and clustered together, and at other portions different from the portion thereof, the front face of the selvage part was shaved off and the warp yarn was fluffed, so that there often existed portions where

the selvage part formed from the outer selvage and the selvage part formed from the area for the selvage part could be easily distinguished only by viewing from the front face of the hook-and-loop fastener.

[0214] Further, the thickness (T_b) of the warp yarn in the base fabric thickness direction at a position at which the warp yarn subducts most toward the rear face side and the thickness (T_s) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side, of the loop hook-and-loop fastener with the selvage parts were measured, the ratio thereof was obtained, and $(T_b)/(T_s)$ was 0.98. Further, the hook-and-loop fastener was waving in some places, and a floated portion was a portion where the front face of the selvage part was shaved off, and a subducted portion was a portion where stumps of clipping the engaging elements protruded from the front face of the selvage part and were clustered.

[0215] The engaging force of this loop hook-and-loop fastener was measured. The initial engaging force was 13.4 N/cm² in shear strength and 1.07 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 10.6 N/cm² in shear strength and 0.86 N/cm in peel strength, which were considerably inferior to those of the loop hook-and-loop fastener of Example 1. Further, the pull-out force of the loop-shaped engaging element was 17.5 N, which was also inferior to that of Example 1, and this could be confirmed that portions where the loop-shaped engaging element was pulled out from the base fabric by 1000 times of repetition of engagement and peeling, and where long loops protruded on the front face were observed in many places.

Comparative Example 2

[0216] A hook hook-and-loop fastener with selvage parts was produced in the same manner as in Example 2, except that the operation of running and pressing the woven-fabric for the hook-and-loop fastener against along a stainless steel fixed surface having a mirror-finished surface placed in the immediately vicinity of the outlet of the heat treatment furnace with the heat-fusible component still in a molten state in Example 2, that is, the step 3 was not performed and after heat-treated, the method was replaced with the method of being taken up by a roller after the weft yarn was sufficiently cooled.

[0217] On the selvage part of the hook hook-and-loop fastener with the selvage parts, stumps of clipping the engaging elements protruded from the front face of the hook-and-loop fastener at a portion thereof and clustered together, and a person touching the hook hook-and-loop fastener had an impression that the selvage part is different from the usual selvage part by the end parts of the stumps. In addition, there were portions where the front face of the hook-and-loop fastener was shaved off and the warp yarn was fluffed at other portions of the selvage part different from the portion thereof, and, as in the loop hook-and-loop fastener of Comparative Example 1, there often existed portions where the selvage part formed from the outer selvage and the selvage part formed from the area for the selvage part could be easily distinguished from each other only by viewing from the front face of the hook-and-loop fastener.

[0218] Further, the thickness (T_b) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side and the

thickness (Ts) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side, of the hook hook-and-loop fastener with the selvage parts were measured, the ratio thereof was determined, and (Tb)/(Ts) was 0.96. Further, the selvage part of the hook hook-and-loop fastener was waving in some places, and the floated selvage part formed a portion where the front face of the hook-and-loop fastener was shaved off, and the subducted selvage part formed a portion where the stumps left uncut at the time of clipping the engaging elements protruded from the front face of the hook-and-loop fastener and clustered.

[0219] The engaging force of this hook hook-and-loop fastener was measured. The initial engaging force was 12.2 N/cm² in shear strength and 1.13 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 10.2 N/cm² in shear strength and 0.83 N/cm in peel strength, which were inferior to those of the hook hook-and-loop fastener of Example 2. Further, the pull-out force of the hook-shaped engaging element of the hook hook-and-loop fastener was 5.3 N, which was also inferior to that of Example 2. Further, the hook-shaped engaging element was pulled out from the base fabric by 1000 times of repetition of engagement and peeling, and portions where long the hook-shaped engaging elements protruded were observed, and therefore, it was also considered that the above-described pull-out resistance was inferior.

Comparative Example 3

[0220] A hook-and-loop coexisting hook-and-loop fastener with selvage parts was prepared in the same manner as in Example 3, except that the operation of running and pressing the woven-fabric for the hook-and-loop fastener against along a stainless steel fixed surface having a mirror-finished surface placed in the immediately vicinity of the outlet of the heat treatment furnace with the heat-fusible component still in a molten state in Example 3, that is, the step 3 was not performed and after heat-treated, the method was replaced with the method of being taken up by a roller after the weft yarn was sufficiently cooled.

[0221] With respect to the state of the selvage part of the obtained hook-and-loop coexisting type hook-and-loop fastener with the selvage parts, as in Comparative Examples 1 and 2, a portion where the stumps of the engaging elements were largely protruded from the front face of the hook-and-loop fastener and a portion where the front face of the hook-and-loop fastener was shaved off and the warp yarn was fluffed were observed, and the selvage part formed from the outer selvage part and the selvage part formed from the area for the selvage part could be easily distinguished from each other only by viewing from the front face of the hook-and-loop fastener.

[0222] Further, the thickness (Tb) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side and the thickness (Ts) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side, of the hook-and-loop coexisting type hook-and-loop fastener were measured. (Tb) was 0.098 mm and (Ts) was 0.102 mm, and therefore, (Tb)/(Ts) was 0.96. Further, the selvage part of the hook-and-loop fastener was waving in some places, and a floated portion corresponded to the portion where the front face of the base fabric of the selvage part was shaved off, and a subducted portion

corresponded to the portion where the stumps left after the clipping of the engaging elements protruded from the front face of the selvage part.

[0223] The engaging force of this hook-and-loop coexisting type hook-and-loop fastener was measured. The initial engaging force was 10.0 N/cm² in shear strength and 0.91 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 7.5 N/cm² in shear strength and 0.79 N/cm in peel strength, which were values inferior to those of Example 3. Further, the pull-out force of the hook-shaped engaging element of this hook hook-and-loop fastener was 4.4 N, which was also inferior to that of Example 2.

Example 7

[0224] A hook hook-and-loop fastener was produced in the same manner as in Example 2, except that the fixed surface pressed against in a state in which the heat-fusible component was still kept in a molten state in Example 2 was replaced with a mirror-finished roll surface made of stainless steel having a satin-finished surface. Note that the roll surface rotated at a speed slower than the running speed of the woven-fabric for the hook hook-and-loop fastener running in contact therewith by 5 mm/second, the contact time between the rear face of the base fabric and the roll surface was 5 seconds, the woven-fabric was pressed against the roll surface while the heat-fusible fiber was kept in a molten state and was slid on the roll surface, and rotated ¼ turn along the roll surface. Further, a tensile force of 250 g/cm was applied to the base fabric after passing through the roll surface.

[0225] In this hook hook-and-loop fastener with the selvage parts, as in the case of Example 2, in the selvage part, there were not found any stumps of the engaging element projected from the front face of the base fabric and any shaved-off portions of the base fabric, and all the engaging elements were clipped in the vicinity of the bases of the engaging elements and at a height so as to be flush with the front face of the base fabric, and the selvage part formed from the outer selvage part and the selvage part formed from the area for the selvage part could not be apparently distinguished from each other from the appearance only by viewing from the front face of the hook-and-loop fastener. Further, the thickness (Tb) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side and the thickness (Ts) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side, of the hook hook-and-loop fastener with the selvage parts were measured, the ratio thereof was determined, and (Tb)/(Ts) was 0.92. Further, the selvage part of the hook hook-and-loop fastener was completely flat, and waving in up-and-down direction, which was observed in the selvage part of the conventional hook-and-loop fastener, was not observed at all.

[0226] The engaging force of this hook hook-and-loop fastener was measured. The initial engaging force was 15.3 N/cm² in shear strength and 1.21 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 14.5 N/cm² in shear strength and 1.19 N/cm in peel strength, and it was found that it had an excellent engaging force as a hook hook-and-loop fastener. Further, the pull-out force of the hook-shaped engaging element of this hook-and-loop fastener was 6.2 N, which was the excellent pull-out resistance, and even when the engagement

and peeling were repeated 1000 times, there were not found any traces that the hook-shaped engaging element was pulled out from the base fabric, or there were not found any portions that it was pulled out from the front face of the base fabric and protruded long on the front face.

Example 8

[0227] A hook hook-and-loop fastener was produced in the same manner as in Example 2 except that the monofilament yarn for the hook-shaped engaging element used in Example 2 was replaced with the following.

[Monofilament Yarn for Hook-Shaped Engaging Element]

[0228] Monofilament yarn made of polyethylene terephthalate homopolymer

[0229] Fineness: 450 dtex (diameter: 0.21 mm)

[0230] Dry heat shrinkage at 180° C.: 18%

[0231] The average height (Ha) of the hook-shaped engaging elements existing on the the front face of the base fabric of the hook hook-and-loop fastener obtained was 1.54 mm. In this hook hook-and-loop fastener with the selvage parts, as in Example 2, in the selvage part, there were not found any stumps projected from the front face of the base fabric of the engaging element and any shaved-off portions of the base fabric, and all the engaging elements were clipped in the vicinity of the bases of the engaging elements and at a height so as to be flush with the front face of the base fabric, and the selvage part formed from the outer selvage part and the selvage part formed from the area for the selvage part could not be distinguished from each other only by viewing from the front face of the hook-and-loop fastener.

[0232] Further, the thickness (Tb) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side and the thickness (Ts) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side were measured, the ratio thereof was determined, and (Tb)/(Ts) was 0.87. The engaging force of this hook hook-and-loop fastener was measured. The initial engaging force was 18.0 N/cm² in shear strength and 1.69 N/cm in peel strength, and the engaging force after 2000 times of engagement and peeling was 15.3 N/cm² in shear strength and 1.44 N/cm in peel strength, and it had an excellent engaging force. The pull-out force of the hook-shaped engaging element was 6.0 N, and the hook-shaped engaging element was also excellent in pull-out resistance, and this could be also confirmed that trace of the the hook-shaped engaging element being pulled out from the base fabric or long protrusion on the front face being pulled out from the front face of the base fabric was not observed at all even after 1000 times of repetition of engagement and peeling.

Example 9

[0233] A hook-shaped engaging element was produced in the same manner as in Example 2, except that the monofilament yarn for the hook-shaped engaging element and the warp yarn used in Example 2 were replaced with those having a low dry-heat shrinkage percentage as described below.

[Monofilament Yarn for Hook-Shaped Engaging Element]

[0234] Monofilament yarn made of polyethylene terephthalate homopolymer

[0235] Fineness: 350 dtex (diameter: 0.18 mm)

[0236] Dry heat shrinkage at 180° C.: 14%

[Warp Yarn]

[0237] Multifilament yarn made of polyethylene terephthalate homopolymer

[0238] Total decitex and number of filaments: 30 of 167 dtex

[0239] Dry heat shrinkage at 180° C.: 12%

[0240] As in Example 2, the obtained hook hook-and-loop fastener with the selvage parts was excellent in flexibility, and in the selvage parts, there were not found any unclipped portions of the engaging elements, stumps, and any shaved-off portions of the hook-and-loop fastener base fabric. Further, the thickness (Tb) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward a rear face side and the thickness (Ts) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side were measured, the ratio thereof was determined, and (Tb)/(Ts) was 0.88. Further, as in the hook hook-and-loop fastener of Example 2, no waving in the up-and-down direction was observed.

[0241] The engaging force of this hook hook-and-loop fastener was measured. The initial engaging force was 15.3 N/cm² in shear strength and 1.19 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 14.6 N/cm² in shear strength and 1.11 N/cm in peel strength, which was slightly inferior to those of Example 2 as a hook-and-loop fastener, but was sufficiently excellent engaging force for use as a hook-and-loop fastener. Further, the pull-out force of the hook-shaped engaging element was 5.8 N, which was slightly inferior to that of Example 2, but was an excellent pull-out resistance as a hook-and-loop fastener, as in the engaging force. In addition, the hook-shaped engaging element pulled out from the base fabric by the repetition of 1000 times of engagement and peeling was slightly found, and it was found that the pull-out resistance of the hook-shaped engaging element was lower than that of Example 2.

Example 10

[0242] A loop hook-and-loop fastener was produced in the same manner as in Example 1, except that the multifilament yarn for the loop-shaped engaging element and the warp yarn used in Example 1 were replaced with those having a low dry-heat shrinkage percentage as described below

[Multifilament Yarn for Loop-Shaped Engaging Element]

[0243] Multifilament yarn made of polybutylene terephthalate homopolymer

[0244] Total decitex and number of filaments: 8 of 305 dtex

[0245] Dry heat shrinkage at 180° C.: 11%

[Warp Yarn]

[0246] Multifilament yarn made of polyethylene terephthalate homopolymer

[0247] Total decitex and number of filaments: 30 of 167 dtex

[0248] Dry heat shrinkage at 180° C.: 12%

[0249] The obtained loop hook-and-loop fastener with the selvage parts was excellent in flexibility as in Example 1, and in the selvage parts, there were not found any unclipped portions of the engaging elements, stumps, and any shaved-off portions of the hook-and-loop fastener base fabric. The thickness (Tb) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side and the thickness (Ts) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side were measured, and (Tb)/(Ts) was 0.83. Further, as in the loop hook-and-loop fastener in Example 1, no waving in the up-and-down direction was observed.

[0250] The engaging force of the loop hook-and-loop fastener was measured. The initial engaging force was 14.2 N/cm² in shear strength and 1.10 N/cm in peel strength, and the engaging force after 1000 times of engagement and peeling was 13.8 N/cm² in shear strength and 1.01 N/cm in peel strength, which was sufficiently excellent engaging force for use as a hook-and-loop fastener as in the case of the hook-and-loop fastener of Example 9. Further, the pull-out force of the loop-shaped engaging element was 18.0 N, which was slightly inferior to that of Example 1, but was an excellent pull-out resistance as a hook-and-loop fastener. In addition, the loop-shaped engaging element pulled out from the base fabric by the repetition of 1000 times of engagement and peeling was slightly found, and it could be confirmed that the pull-out resistance of the loop-shaped engaging element was lower than that of Example 2.

Example 11 and Comparative Example 4

[0251] Each of the six types of long hook-and-loop fastener with both selvage parts obtained in Examples 1 to 3 and Comparative Examples 1 to 3 in which one selvage part was a selvage part formed from the outer selvage part, and a selvage part at opposite side was a selvage part obtained by slitting the center of the area for the selvage part was wound into a roll shape, each of the roll shaped wound products was placed on a partition plate, the partition plates were stacked with a gap in the up-and-down direction and inserted into a dyeing vessel, and the dye liquid was circulated in the vessel to bring the hook-and-loop fastener into contact with the dye liquid to perform dyeing. At this time, the dyeing temperature was 135° C., the dyeing time was 30 minutes while maintaining 135° C., and a disperse dye of deep red color was used as the dye. Then, after dyeing, reduction washing and rinsing with water were performed, and the roll-shaped hook-and-loop fastener was taken out from the dyeing vessel and dried.

[0252] Regarding the dyed hook-and-loop fastener, all of the hook-and-loop fasteners of Examples 1 to 3 had no dyeing unevenness and were dyed in a uniform deep color, whereas all of the hook-and-loop fasteners of Comparative Examples 1 to 3 appeared to be uniformly dyed at first glance, but when observed well, pale portions and deep portions of dyeing were observed in various places, and they were inferior in terms of uniform dyeability. Further, in all the hook-and-loop fasteners of Examples 1 to 3, no waving was observed even after dyeing, whereas in all the hook-and-loop fasteners of Comparative Examples 1 to 3, the waving was further enlarged by dyeing.

[0253] Note that, in all hook-and-loop fasteners, even the cut face of the engaging element-cut stump of the selvage part was dyed, the presence of the end part of the stump was inconspicuous, the selvage part formed from the outer selvage part and the selvage part obtained by slitting the center of the area for the selvage part could not be distinguished from each other, and both selvage parts were uniformly dyed.

[0254] The hook-and-loop fastener of each of Examples 1 to 3 and Comparative Examples 1 to 3 had the same value as the (Tb)/(Ts) value described in each of Examples 1 to 3 even after being dyed.

Comparative Example 4

[0255] A loop hook-and-loop fastener with selvage parts was produced in the same manner as in Example 1, except that the operation of running and pressing the woven-fabric for the hook-and-loop fastener against along a stainless steel fixed surface having a mirror-finished surface placed in the immediately vicinity of the outlet of the heat treatment furnace with the heat-fusible component still in a molten state in Example 1, that is, the step 3 was not performed and after heat-treated, the method of pressing was replaced with the method of winding in a roller heated to 180° C. without pressing after the weft yarn was sufficiently cooled.

[0256] On the selvage part of the loop hook-and-loop fastener with the selvage parts, stumps formed by clipping the engaging elements and protruded from the front face of the selvage part at a portion thereof and clustered together, and at other portions different from the portion thereof, the front face of the selvage part was shaved off and the warp yarn was fluffed, so that there often existed portions where the selvage part formed from the outer selvage and the selvage part formed from the area for the selvage part could be easily distinguished from each other only by viewing from the front face of the hook-and-loop fastener.

[0257] Further, the thickness (Tb) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side and the thickness (Ts) of the warp yarn in the base fabric thickness direction at the position at which the warp yarn floats most toward the front face side, of the loop hook-and-loop fastener with the selvage parts were measured, the ratio thereof was determined, and (Tb)/(Ts) was 0.98. Further, the hook-and-loop fastener was waving in some places, and a floated portion was a portion where the front face of the selvage part was shaved off, and a subducted portion was a portion where stumps of clipping the engaging elements protruded from the front face of the selvage part and were clustered.

[0258] At first glance, the dyed hook-and-loop fastener appeared to be uniformly dyed, but when the observed well, pale portions and deep portions of dyeing were observed in various places, they were inferior in terms of uniform dyeability, and the waving was further enlarged by dyeing.

REFERENCE SIGNS LIST

- [0259] 1: hook-and-loop fastener before cutting selvage part area
- [0260] 2: hook-and-loop fastener after cutting selvage part area
- [0261] 3: selvage part
- [0262] 3a: outer selvage part
- [0263] 3b: area for selvage part

- [0264] 4: engaging element area
- [0265] 5: hook-and-loop fastener
- [0266] 6: warp yarn
- [0267] 7: weft yarn
- [0268] 8: engaging element
- [0269] L: loop for engaging element
- [0270] K: base fabric thickness direction
- [0271] 9: heat treatment furnace
- [0272] 10: fixed surface or roll surface
- [0273] Wa: warp yarn direction
- [0274] We: weft yarn direction
- [0275] Tb: thickness of warp yarn in base fabric thickness direction at position at which warp yarn subducts most toward rear face side
- [0276] Ts: thickness of warp yarn in base fabric thickness direction at position at which warp yarn floats most toward front face side

1. A polyester-based woven-fabric hook-and-loop fastener having selvage parts comprising: a base fabric being a woven-fabric made of a warp yarn and a weft yarn, both being polyester-based yarns, and a yarn for an engaging element woven in parallel into the warp yarn; and the engaging element made of the yarn for the engaging element existing on a front face side of the base fabric and having at least one kind of shape selected from the group consisting of a large number of loop shapes and a large number of hook shapes, rising from a front face of the base fabric,

the weft yarn containing a heat-fusible component, a base of the engaging element being fixed to the base fabric by the heat-fusible component, and

the selvage parts in which the engaging element is not present being present at both end parts in parallel in a warp yarn direction of the base fabric,

wherein the polyester-based woven-fabric hook-and-loop fastener satisfies constitutions (1) and (2) described below:

(1) a thickness of the warp yarn in a base fabric thickness direction at a position at which the warp yarn, which alternately runs over and under the weft yarn with the weft yarn interposed therebetween, subducts most toward a rear face side is 0.94 times or less of a thickness thereof at a position at which the warp yarn floats most toward the front face side;

(2) at least one selvage part of the selvage parts existing at both end parts is formed by cutting and removing a base part of the engaging element.

2. The polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 1, wherein the thickness of the warp yarn in the base fabric thickness direction at the position at which the warp yarn subducts most toward the rear face side is in the range of 0.7 to 0.90 times the thickness thereof at the position at which the warp yarn floats most toward the front face side.

3. The polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 1, wherein a back coating resin layer for fixing the engaging element to the base fabric is not present on the rear face of the base fabric.

4. The polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 1, wherein a pull-out force of the engaging element from the base fabric is 5.5 N or more.

5. The polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 1, which is dyed with a disperse dye.

6. A method for producing a polyester-based woven-fabric hook-and-loop fastener having selvage parts, the polyester-based hook-and-loop fastener comprising: a base fabric being a woven-fabric woven from a warp yarn and a weft yarn, both being polyester-based heat-shrinkable yarns, and a yarn for an engaging element; and the engaging element in which the yarn for the engaging element has at least one kind of shape selected from the group consisting of a loop shape and a hook shape, formed by raising the yarn for the engaging element from a front face of the base fabric, the weft yarn containing a heat-fusible component, and a base of the engaging element rising from the front face of the base fabric being fixed to the base fabric by fusion of the heat-fusible component, wherein [step 1] to [step 6] described below are performed in this order:

[step 1] a step of weaving the base fabric in which the yarn for the engaging element is woven in parallel to the warp yarn and a large number of loops for engaging elements formed of the yarn for the engaging element and rising from the front face of the base fabric are present on a front face side of the base fabric;

[step 2] a step of guiding the base fabric to a heating region, heating at a temperature equal to or higher than a temperature at which the heat-fusible component is melted, heat-shrinking a yarn constituting the base fabric, and allowing a melt from the weft yarn to penetrate into the base fabric;

[step 3] a step of taking out the base fabric from the heating region and pressing a rear face of the base fabric against a fixed surface or a roll surface in a state in which the heat-fusible component is melted;

[step 4] a step of, after cooling the base fabric, when the loops for the engaging elements existing on the front face of the base fabric are for hook-shaped engaging elements, cutting one leg of the loops to form the hook-shaped engaging elements;

[step 5] a step of removing the engaging elements by cutting vicinity of the base of the engaging element continuously in a warp yarn direction of the base fabric at a predetermined interval in a weft yarn direction of the base fabric to continuously form an area for the selvage parts in which the engaging element is not present and an engaging element area in the warp yarn direction of the base fabric;

[step 6] a step of continuously forming, in the warp yarn direction of the base fabric, a plurality of engaging element areas having the selvage parts at both side parts in the weft yarn direction by cutting, in the warp yarn direction, a substantially intermediate part of the area for the selvage parts in the weft yarn direction to form the selvage parts.

7. The method for producing the polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 6, wherein [step 3] is performed by a method in which the base fabric is allowed to run while sliding on the fixed surface while pressing the rear face of the base fabric against the fixed surface, and a running direction of the base fabric is changed on the fixed surface.

8. The method for producing the polyester-based woven-fabric hook-and-loop fastener having the selvage parts

according to claim 6, wherein [step 3] is performed by utilizing a residual heat of [step 2] following [step 2] without once cooling the base fabric taken out from [step 2].

9. The method for producing the polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 6, wherein [step 1] to [step 4] are continuously performed without winding in a middle.

10. The method for producing the polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 6, wherein [step 3] is performed without pressing the front face side of the base fabric against the fixed surface or the roll surface.

11. The method for producing the polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 6, wherein a dry-heat shrinkage percentage at 180° C. of the warp yarn used for the woven-fabric is in a range of 5 to 20%, and the dry-heat shrinkage percentage at 180° C. of the weft yarn and the yarn for the engaging element are both in a range of 15 to 30%.

12. The method for producing the polyester-based woven-fabric hook-and-loop fastener having the selvage parts according to claim 6, wherein a dyeing step of dyeing with a disperse dye is performed between [step 5] and [step 6] or after [step 6].

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