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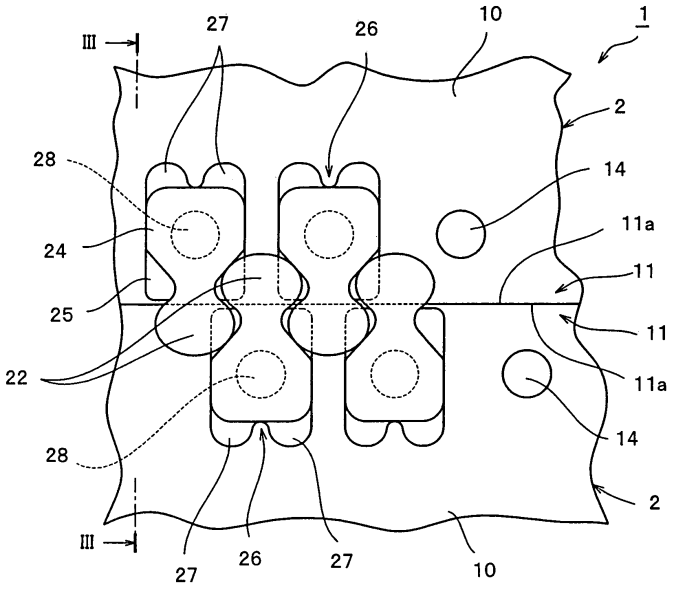
(54) Waterproof slide fastener

(57) The invention provides a waterproof slide fastener (1) comprising: a pair of fastener stringers (2) in which a plurality of fastener elements (21) are arranged in line by molding integrally along opposing element attaching edge portions (11) of a pair of waterproof fastener tapes (10), in which a belt shaped core material (12) composed of a woven fabric, knitted fabric or unwoven fabric is covered with a waterproof layer (13); and a slider for engaging and disengaging the fastener elements (21), wherein the waterproof layer (13) is composed of a polyurethane elastomer and the fastener elements (21) are composed of a polymer alloy of polyurethane resin and ABS resin, thereby providing the waterproof slide fastener in which its fastener tape has an excellent adhesion characteristic to an attachment object such as the one covered with urethane coating, an excellent bending characteristic, and a high fixing strength between the fastener tape and a fastener element, the waterproof slide fastener further having an excellent engaging strength and water-tightness.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a waterproof slide fastener in which a slider slides over a pair of fastener stringers. Each stinger is provided with a plurality of synthetic resin fastener elements by integrally molding them on attaching edge portions of waterproof fastener tapes produced by covering a woven or knitted core material with a waterproof layer.

2. Description of the Related Art

[0002] This kind of the waterproof slide fastener has a pair of right and left fastener tapes. Each fastener tape contains a belt body woven or knitted with a fiber yarn or a belt-like unwoven fabric as its core material, and both front and rear faces of the core material are covered with a waterproof layer composed of an elastomer. With side edge portions opposing each other of the pair of fattener tapes serving as element attaching edge portions, fastener elements made of synthetic resin are integrally molded along the element attaching edge portions such that they stride over both the front and rear faces of the tape by injection molding, whereby fastener stringers are formed. Further, a slider for engaging or disengaging the right and left fastener elements is inserted through the element rows of the fastener stringers.

[0003] Generally, in the waterproof slide fastener, through holes which penetrate through the front and rear faces of the fastener tape are formed preliminarily at a molding portion for each fastener element on the element attaching edge portion of the fastener tape. When synthetic resin is molded by injection molding to each element molding portion having the through hole, the fastener element is formed symmetrically with the through hole serving as a passage for synthetic resin, on both the front and rear faces of the tape such that the fastener elements sandwich the element attaching edge portion. Further, each fastener element is formed such that an element upper half portion on the tape front face side and an element lower half portion on the rear face side are connected and integrated through a connecting portion penetrating through the through hole, thereby intensifying the connecting strength between the fastener tape and the fastener element.

[0004] An example of a conventional waterproof slide fastener having such a structure is described in Japanese Utility Model Publication No. 63-30247 and Japanese Patent Laid-Open Publication No. 2005-237577.

[0005] For example, in the waterproof slide fastener described in the Japanese Utility Model Publication No. 63-30247, a waterproof layer is formed on front and rear faces of a fastener tape, and through holes are formed in element attaching edge portions of the fastener tape. Upper and lower half portions of the fastener element are formed on the front and rear faces of the element attaching edge portion, and the upper and lower half portions of the element are integrated through a connecting portion penetrating through the through hole in the element attaching edge portion. Further, in the waterproof slide fastener of the Japanese Utility Model Publication No. 63-30247, an adhesive agent layer is formed on both the front and rear faces corresponding to the periphery of at least the through holes in the fastener tape. A border portion at which the fastener tape around the through hole makes contact with the fastener element is closed by the adhesive agent layer, thereby maintaining watertightness at the border portion.

[0006] On the other hand, the Japanese Patent Laid-Open Publication No. 2005-237577 has described a waterproof slide fastener having a feature in the shape of a fastener element. In one type of the waterproof slide fastener described in the Japanese Patent Laid-Open Publication No. 2005-237577, each fastener element includes a coupling head, a neck portion, a body portion and leg portions each composed of upper and lower half portions molded integrally on the front and rear faces of the tape, the leg portions extending to the inward of the fastener tape from the body portion. Those half portions are connected integrally through a connecting portion penetrating through a through hole formed in a fastener element attaching portion. In each fastener element, each half portion of the coupling head and leg portion is formed thinner in a direction perpendicular to the front and rear faces of the fastener tape than each half portion of the neck portion and body portion. Further, the upper and lower half portions of the leg portion guide upper and lower flanges of the slider through a sliding motion, and two or more half portions are disposed at predetermined intervals in a sliding direction of the slider.

[0007] In the waterproof slide fastener of the Japanese Patent Laid-Open Publication No. 2005-237577 in which the fastener element having such a shape is formed on the element attaching edge portion, two or more upper and lower half portions of the leg portions for guiding the slider through the sliding motion are provided in the sliding direction, thereby reducing sliding resistance at the time of sliding of the slider, to lead to a smooth sliding operation of the slider. Moreover, the fastener tape is pressed from both the front and rear faces thereof by a mold face between half portion molding cavities for the leg portion when the injection molding of the fastener elements is carried out. For this reason, no swing occurs in the fastener tape during molding, so that each leg portion is integrated by fusion strongly to both the front and rear faces of the fastener tape. Consequently, there occurs an advantage that fixing strength of the fastener element to the fastener tape is increased.

[0008] According to the Japanese Utility Model Publication No. 63-30247 and Japanese Patent Laid-Open Publication No. 2005-237577, the fastener tape of the waterproof slide fastener uses a belt-like body woven or

knitted with a fiber yarn as its core material, both the front and rear faces of the belt shaped core material are covered with a waterproof layer, and an elastomer composed of natural rubber, synthetic rubber or the like is used as the waterproof layer. However, these Japanese Utility Model Publication No. 63-30247 and Japanese Patent Laid-Open Publication No. 2005-237577 describe materials applicable as the waterproof layer roughly, and most waterproof slide fastener currently marketed is generally composed of a thermoplastic polyester elastomer (specifically, Hytrel (registered trademark)) excellent in strength, durability, molding processability and the like as the waterproof layer. Polybutylene terephthalate having excellent adhesion to the Hytrel (registered trademark) and strength is used as a material of the fastener element to be formed on the fastener tape.

[0009] On the other hand, in recent years, application of the waterproof slide fastener has been expanding and correspondingly, an object on which the waterproof slide fastener is attached has been diversified, so that the waterproof slide fastener has been demanded to be improved in its adhesion characteristic to the attachment object. However, although the thermoplastic polyester elastomer for covering the fastener tape is excellent in strength and molding processability, its adhesion characteristic to the attachment object composed of polyurethane base is poor. For this reason, a fastener tape having a waterproof layer composed of a thermoplastic polyester elastomer cannot be bonded to a polyurethane base material or polyurethane coated material easily. In particular, when an attempt is made to attach a waterproof slide fastener having the waterproof layer formed of a polyester elastomer to an attachment object composed of polyurethane base, high frequency fusion which is ordinarily used cannot be adopted, and instead, sewing or adhesive agent is needed, so that work requiring time and labor is necessary.

[0010] Further, a polyester elastomer is poor in plasticity as an elastomer. Thus, a fastener tape covered with a polyester elastomer tends to be relatively hard, so that flexibility at the time of bending the tape into a U shape or twisting it through its front and rear faces is low. Therefore, when a waterproof slide fastener in which its waterproof layer is formed of a polyester elastomer is attached to an attachment object such as a wet suit, an attachment portion of the waterproof slide fastener becomes hard. As a consequence, a user feels it difficult to wear or put out the attachment object, and wear comfort when he/she wears it may lower.

[0011] In the meantime, in order to improve the adhesion characteristic to the attachment object of polyurethane base, it can be considered to use a polyurethane elastomer which is easier to bond to the polyurethane base attachment object than the polyester elastomer, and which is more plastic as a waterproof layer to be formed on the fastener tape. However, if the waterproof layer of the fastener tape is just formed of a polyurethane elstomer, the adhesion characteristic to fastener elements of polybutylene terephthalate drops largely.

[0012] Thus, even if each fastener element is formed on the fastener tape by connecting the upper and lower half portions integrally through the connecting portion penetrating through the through hole in the element attaching edge portion, fixing strength between the fastener tape and the fastener element necessarily drops. This possibly lowers the engaging strength and water tightness of the waterproof slide fastener. Further, the fastener element may rotate around the connecting portion, so that right and left element rows cannot be engaged with each other properly.

SUMMARY OF THE INVENTION

[0013] Accordingly, the present invention has been achieved in views of the above-described problems, and an object of the invention is to provide a waterproof slide fastener in which its fastener tape has an excellent adhesion characteristic to an attachment object such as the one covered with urethane coating, an excellent bending characteristic, and a high fixing strength between the fastener tape and a fastener element, the waterproof slide fastener further having an excellent engaging strength and water-tightness.

[0014] To achieve the above-described object, the waterproof slide fastener of the present invention is a waterproof slide fastener having a waterproof structure, being characterized by comprising: a pair of fastener stringers in which a plurality of fastener elements are arranged in line by molding integrally along opposing element attaching edge portions of a pair of waterproof fastener tapes, in which a belt shaped core material composed of a woven fabric, knitted fabric or unwoven fabric is covered with a waterproof layer; and a slider for engaging and disengaging the fastener elements; wherein the waterproof layer is composed of a polyurethane elastomer, and the fastener elements are composed of a polymer alloy of polyurethane resin and ABS resin.

[0015] Preferably, a ratio between the polyurethane resin and the ABS resin (polyurethane resin/ABS resin) in the polymer alloy is 20/80 to 50/50 in terms of a weight ratio.

[0016] In the fastener tape of the waterproof slide fastener of the invention, the belt shaped core material is covered with the waterproof layer composed of a polyurethane elastomer, and a plurality of fastener elements of a polymer alloy of polyurethane resin and ABS resin are attached and molded integrally on the fastener tape.

[0017] The inventors of the present invention have considered use of a polyurethane elastomer as a material of the waterproof layer instead of a conventionally generally used polyester elastomer (for example, Hytrel) in order to intensify an adhesion characteristic of the fastener tape having its waterproof layer covered thereon to an attachment object such as the one covered with urethane coating. However, if the waterproof layer is formed of a polyurethane elastomer, there is a problem

that an adhesion characteristic to fastener elements of polybutylene terephthalate is lowered as described above. Then, the inventors accumulated experiments and considerations for using new synthetic resin indicating an excellent adhesion characteristic having a good affinity to the polyurethane elastomer instead of the conventionally general polybutylene terephthalate.

[0018] First, the inventors considered using polyurethane resin independently taking into account the affinity and adhesion characteristics to the polyurethane elastomer of the waterproof layer as a material of the fastener element. However, although the adhesion characteristic to the polyurethane elastomer is improved if the fastener elements are formed of only polyurethane resin, it takes a long time for resin to be cooled and hardened when the fastener elements are molded, so that a gate is difficult to cut out, thereby presenting poor moldability. Further, it is apparent that the fastener element formed of polyurethane resin is lack of practicality because it is very soft and short of stiffness as the element. It can be considered to use ABS resin or polycarbonate resin as well as polyurethane resin as the material of the fastener element. However, if any one of these resin materials is used independently, it is difficult to obtain the strength of an element and chemical resistance of the element is poor.

[0019] Next, to solve the aforementioned inconvenience in case of using polyurethane resin for the material of the fastener element, further experiments and considerations were accumulated about the material. As a result, it has been found that because the ABS resin has a good affinity with polyurethane resin and excellent moldability, use of a polymer alloy of polyurethane resin and ABS resin as the material of the fastener element improves apparently the moldability of the fastener element and intensifies the stiffness of the fastener element, thereby reaching completeness of the present invention.

[0020] That is, if the waterproof layer to be formed in the fastener tape is made of a polyurethane elastomer and the fastener element to be molded integrally on the fastener tape is a waterproof slide fastener composed of a polymer alloy of polyurethane resin and ABS resin, the properties of the respective materials can be exerted. Consequently, the fastener tape has an excellent adhesive characteristic to an attachment object such as the one covered with urethane coating and an excellent abrasion resistance. Further, the moldability and stiffness of the fastener element are excellent and fixing strength between the fastener tape and the fastener element is raised.

[0021] Thus, the waterproof slide fastener of the present invention has an excellent adhesive characteristic to an attachment object made of polyurethane base synthetic resin because it is easy to be molded and the surface of the fastener tape is covered with a polyurethane elastomer. Thus, the waterproof slide fastener is preferably applicable to the attachment object composed of polyurethane base. The waterproof slide fastener of the present invention is excellent in flexibility, abrasion resistance, engaging strength and water-tightness of its tape.

[0022] Furthermore, the inventors also considered the ratio between the polyurethane resin and the ABS resin in the polymer alloy which constitutes the fastener element in order to improve the function of the waterproof slide fastener. As a result, when the ratio between the polyurethane resin and the ABS resin (polyurethane resin/ABS resin) in the waterproof slide fastener of the invention is 20/80 to 50/50 in terms of weight ratio, the moldability, strength and stiffness of the fastener element are further improved. Accordingly, the waterproof slide fastener of the invention excels in the traverse pulling resistance and the like, thereby securing high quality. The effects which the present invention exerts are considerably great.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

FIG. 1 is a plan view of major portions mainly showing an engaging portion of the slide fastener of the present invention;
FIG. 2 is an enlarged plan view showing one of fastener elements possessed by the slide fastener;
FIG. 3 is a sectional view taken along the line III-III in FIG. 1;
FIG. 4 is a graph showing a measurement result of traverse pulling resistance;
FIG. 5 is a graph showing a measurement result of push-up resistance;
FIG. 6 is a graph showing a measurement result of pulling resistance; and
FIG. 7 is a graph showing a measurement result of sliding resistance.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] Hereinafter, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. In the meantime, the present invention is not restricted to the embodiment described below, but may be modified in various ways as long as a modification has substantially the same structure and exerts the same operating effect. For example, the shape, dimension and the like of a fastener element are not restricted to the embodiment described below, but may be changed appropriately as required.

[0025] FIG. 1 is a plan view showing part of a waterproof slide fastener of the embodiment, and FIG. 2 is an enlargement plan view showing one of fastener elements possessed by the slide fastener. FIG. 3 is a sectional view taken along the line III-III in FIG. 1.

[0026] The waterproof slide fastener 1 of the embodiment comprises fastener stringers 2, a slider (not shown) made of synthetic resin or metal, a top end stop (not

shown), and a separable bottom end stop (not shown). In the fastener stringers 2, a plurality of fastener elements 21 are molded integrally with an engaging interval to each mating fastener element 21 along an element attaching edge portion 11 disposed on a side edge portion of a fastener tape 10 having waterproof property. The slider (not shown) engages and/or disengages right and left fastener elements 21.

[0027] In the fastener tape 10, the entire front and rear faces of a belt shaped core material 12 made of a fiber yarn woven fabric, knitted fabric or unwoven fabric are covered with a waterproof layer 13 made of a polyurethane elastomer. Because the fastener tape 10 is covered with a polyurethane elastomer, waterproof property can be secured and the fastener tape can be easily attached to an attachment object made of polyurethane base or covered with urethane coating by means of high frequency fusion. Further, the fastener tape itself becomes more flexible than a fastener tape covered with, for example, a polyester elastomer, thereby obtaining an excellent bending property. In each element molding portion of the element attaching edge portion 11 of the fastener tape 10, a through hole 14 is formed, which is large enough for raw material resin of the fastener element 21 in a melting state to pass therethrough.

[0028] The aforementioned fastener element 21 is comprised of a coupling head 22 having an oval circle shape, a substantially hexagonal body portion 24 continuous with the coupling head 22 through a neck portion 23, a wing-like shoulder portions 25 extending on the right and left sides between the neck portion 23 and the body portion 24, and leg portions 27 extending downward while branched to two sections via a crotch portion 26 from the lower end of the body portion 24. The fastener element 21 having such a structure has upper and lower half portions across the element attaching edge portion 11 of the fastener tape 10, and these upper and lower half portions are connected integrally with each other through a connecting portion 28 formed in the through hole 14.

[0029] Respective half portion 22a, 22b; 23a, 23b; 24a, 24b; 25a, 25b; and 27a, 27b of the coupling head 22, neck portion 23, body portion 24, shoulder portion 25 and leg portions 27 are molded integrally in a symmetrical shape on the front and rear faces of the fastener tape 10 across the tape 10. Here, the respective half portion 23a, 23b; 24a, 24b; 25a, 25b; and 27a, 27b excluding the coupling head 22 are integrated with both the front and rear faces of the fastener tape 10 by fusion.

[0030] The half portions 22a, 22b of the coupling head 22 molded symmetrically above and below across the fastener tape 10 extend in parallel outward of an end edge 11a with the end edge 11a of the element attaching edge portion 11 of the fastener tape 10 exposed slightly outward. The exposure length L1 of the end edge 11a of the element attaching edge portion 11 extending from the shoulder portion 25 is set to a dimension in which the exposing end face of the end edge 11a makes a pressure contact with the exposing end face of a mating fastener tape 10 when the coupling head 22 engages a mating coupling head 22. Thus, the opposing end faces of the fastener tapes 10 make a pressure contact with each other in a coupled state so as to exert waterproof performance.

[0031] On the other hand, the respective half portions 23a, 23b; 24a, 24b; 25a, 25b; and 27a, 27b of the neck portion 23, the body portion 24, the shoulder portion 25 and the leg portions 27 are fixed firmly to the element attaching edge portion 11 of the fastener tape 10. Of them, the thickness of the respective half portions 23a, 23b; and 24a, 24b of the neck portion 23 and the body portion 24 is the largest, and the thickness of the respective half portions 25a, 25b; and 27a, 27b of the shoulder portion 25 and the leg portion 27 is set to approximately 1/3 the thickness of the respective half portions 23a, 23b; and 24a, 24b of the neck portion 23 and the body portion 24.

[0032] The outside surface of the half portions 22a, 22b of the coupling head 22 is located on an identical plane to the outside surfaces of the respective half portions 23a, 23b; and 24a, 24b of the neck portion 23 and the body portion 24. Due to such a structure, when the fastener elements 21 engage each other, the half portions 25a, 25b of each shoulder portion 25 of the fastener elements 21 adjacent to the right and left sides make contact with an inside face of the half portions 22a, 22b of the coupling head 22 of the fastener element 21 on one side, as shown in FIGS. 1 and 3.

[0033] In the waterproof slide fastener 1 of this embodiment, the fastener element 21 having the aforementioned structure is formed of a polymer alloy of polyurethane resin and ABS resin. The fastener element 21 made of such a polymer alloy can intensify fixing strength to the fastener tape 10 in which waterproof layer 13 of a polyurethane elastomer has been formed because the polyurethane resin is made complex. In addition, because the ABS resin is also made complex, moldability and stiffness of the fastener element 21 can be improved. In the meantime, the polyurethane resin for use in the polymer alloy is thermoplastic resin, which is different from the polyurethane elastomer of the waterproof layer 13 to be formed in the fastener tape 10, but harder than the elastomer and not stretchable as easily as the elastomer.

[0034] In particularly, the fastener element 21 is configured such that the ratio between the polyurethane resin and the ABS resin in the polymer alloy (polyurethane resin/ABS resin) is 20/80 to 50/50 in terms of weight ratio. If the weight ratio of the polyurethane resin is lower than 20%, no sufficient fixing strength to the fastener tape can be obtained, and the fastener element 21 can be cracked easily due to shortage of the strength. As a result, the engaging strength of the slide fastener 1 can drop. On the other hand, if the weight ratio of the ABS resin is lower than 50%, the moldability and stiffness of the fastener element 21 become insufficient, thereby possibly induc-

ing drop of the engaging strength of the slide fastener 1.

[0035] The slide fastener 1 of the embodiment having the above-described structure can be manufactured according to a conventionally used method. That is, molds having a cavity of a predetermined shape are prepared, and then, the fastener tape 10 covered with a polyurethane elastomer is held by its upper mold and lower mold.

[0036] Next, polyurethane resin chips and ABS resin chips are mixed together at each predetermined weight and fused. The fused resin material is introduced into the cavities of the molds via a sprue, runner and gate. The fused resin introduced into the cavity passes through the through hole 14 in the fastener tape 10, and consequently, the upper and lower half portions of the fastener element 21 are formed symmetrically on both the front and rear faces of the element attaching edge portion 11 and the upper and lower half portions thereof are connected and molded integrally through the connecting portion 28 formed in the through hole 14. As a consequence, the waterproof slide fastener 1 of this embodiment as shown in FIGS. 1 to 3 is obtained.

[0037] In the waterproof slide fastener 1 of this embodiment having the above-described structure, the fastener tape 10 has an excellent adhesion characteristic to an attachment object such as the one covered with urethane coating and excellent abrasion resistance, and further, the moldability and stiffness of the fastener element are excellent. Further, the fixing strength between the fastener tape and the fastener element is high. The waterproof slide fastener is easy to be molded, and the flexibility, engaging strength and water-tightness of the tape are excellent.

Examples

[0038] Hereinafter, examples of the present invention will be described in detail.

[0039] In the examples, five kinds of waterproof slide fasteners having different mixing ratios between polyurethane resin and ABS resin in a polymer alloy constituting fastener elements were manufactured, and the following evaluation was carried out about each slide fastener. The ABS resin used was TOYOLAC (trade mark) resin supplied by Toray Industries Inc., Japan. As the five kinds of the waterproof slide fasteners to be evaluated, waterproof slide fasteners whose ratios between polyurethane resin and ABS resin were respectively 20/80 (Example 1), 30/70 (Example 2), 50/50 (Example 3) and 70/30 (Example 4) in terms of weight ratio were manufactured, and at the same time, a waterproof slide fastener (polyurethane resin/ABS resin = 0/100) whose fastener elements were composed of only ABS resin without mixture of polyurethane resin was manufactured (Comparative Example).

[0040] Next, the obtained five kinds of the waterproof slide fasteners were evaluated about four items of traverse pulling resistance, push-up resistance, pulling resistance and sliding resistance. The traverse pulling resistance here indicates the magnitude of resistance generated when, with the waterproof slide fastener engaged, right and left fastener tapes are pulled at a constant speed in opposite directions to the right and left. The push-up resistance indicates the magnitude of resistance when, with the waterproof slide fastener engaged, the fastener elements are pushed up in a perpendicular direction to the tape face.

[0041] The pulling resistance indicates the magnitude of resistance generated when any one of the fastener elements is pulled outwardly in a tape width direction with a fastener tape fixed in the state of a fastener stringer. The sliding resistance indicates the magnitude of resistance generated when any one of the fastener elements is pulled in a tape length direction. Each magnitude of resistance is a value at the time when the engagement of the slide fastener is released and when the fastener element is broken down or dropped off from the fastener tape.

[0042] In each evaluation of the resistance above, 20 specimens were prepared for each of Examples 1 to 4 and Comparative Example, and resistance test was carried out about five specimens for each of the evaluation items. By averaging measurement values obtained from the five specimens, the resistance of each waterproof slide fastener was evaluated. FIGS. 4 to 7 show results of the traverse pulling resistance, push-up resistance, pulling resistance and sliding resistance obtained about the respective waterproof slide fasteners of Examples 1 to 4 and Comparative Example. For reference, values of the traverse pulling resistance, push-up resistance, pulling resistance and sliding resistance of a conventional waterproof slide fastener in which fastener elements are molded on a fastener tape covered with Hytrel (registered trademark) by injection molding of polybutylene terephthalate are indicated in each graph of FIGS. 4 to 7.

[0043] As shown in FIGS. 4 to 7, the waterproof slide fastener (polyurethane resin/ABS resin = 30/70) of Example 2 presents the highest value in any resistance test, indicating that it is a high quality waterproof slide fastener. The waterproof slide fastener of Example 1 and the waterproof slide fastener of Example 3 indicate slightly low values in pulling resistance and push-up resistance, respectively. However, the traverse pulling resistance which is an important factor for the slide fastener indicates a higher value than that of the conventional waterproof slide fastener, thereby indicating that they are waterproof slide fasteners having excellent engaging strength and high quality.

[0044] Although the waterproof slide fastener of Example 4 indicated a value substantially equal to that of the conventional waterproof slide fastener in association with the pulling resistance and sliding resistance, it indicated a slightly lower value than those of Examples 1 to 3 as the traverse pulling resistance. On the other hand, the waterproof slide fastener of Comparative Example was inferior to the slide fasteners of Examples 1 to 4 in

the traverse pulling resistance and pulling resistance.

[0045] Further, fusion of each of the waterproof slide fasteners of Examples 1 to 4 to an attachment object covered with urethane coating was checked, and consequently, they could be fused without any problem.

[0046] As described above, it has been verified that in the waterproof slide fasteners of Examples 1 to 4, their fastener tapes are easy to bond to the attachment object composed of polyurethane base and plastic, so that the moldability and stiffness of the fastener elements are excellent.

Specifically, Examples 1 to 3 indicate high quality waterproof slide fasteners having excellent traverse pulling resistance, pulling resistance and sliding resistance. In the meantime, a method of using, for example, an absorption ratio of infrared absorption spectrum is available for investigating a ratio between polyurethane resin and ABS resin in terms of weight ratio in the aforementioned polymer alloy. This is a measurement method of investigating the ratio by measuring an amount of absorption because the absorption wavelength differs depending on a difference in composition.

[0047] The present invention is particularly applied to a waterproof slide fastener demanded for an excellent adhesion characteristic to an attachment object of polyurethane base effectively.

Claims

1. A waterproof slide fastener (1) having a waterproof structure, comprising:

   a pair of fastener stringers (2) in which a plurality of fastener elements (21) are arranged in line by molding integrally along opposing edge portions (11) of a pair of waterproof fastener tapes (10), in which a core material (12) of a woven fabric, knitted fabric or unwoven fabric is covered with a waterproof layer (13); and
   a slider for engaging and disengaging the fastener elements (21), being **characterized in that**
   the waterproof layer (13) is composed of a polyurethane elastomer, and the fastener elements (21) are composed of a polymer alloy of polyurethane resin and ABS resin.

2. The waterproof slide fastener according to claim 1, being **characterized in that** a ratio between the polyurethane resin and the ABS resin (polyurethane resin/ABS resin) in the polymer alloy is 20/80 to 50/50 in terms of a weight ratio.

FIG. 1

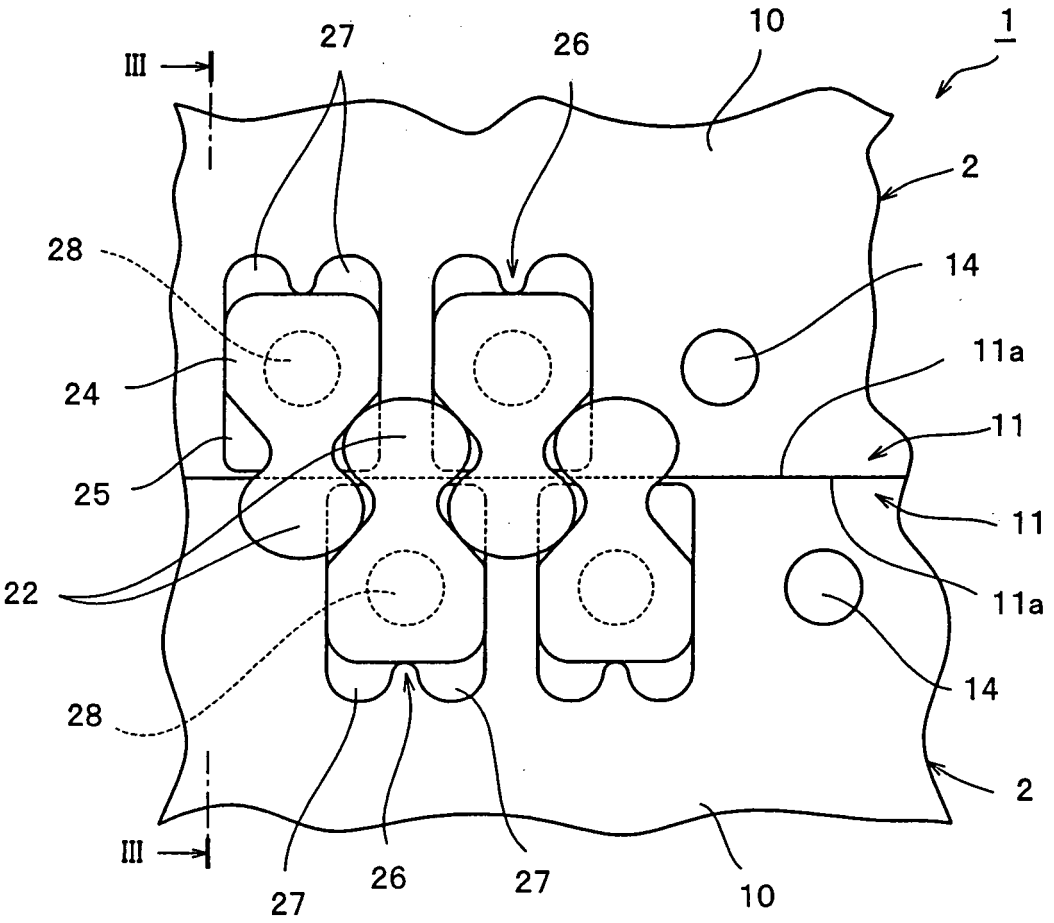

FIG. 2

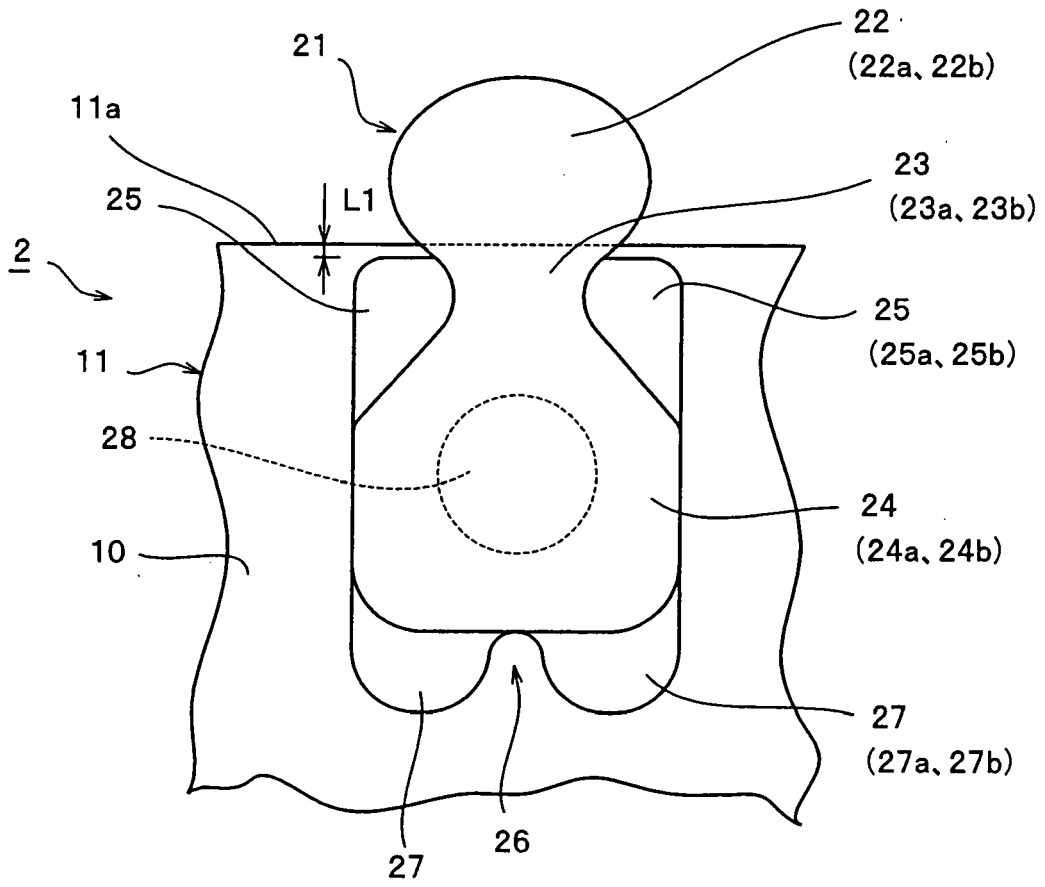
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FIG. 3

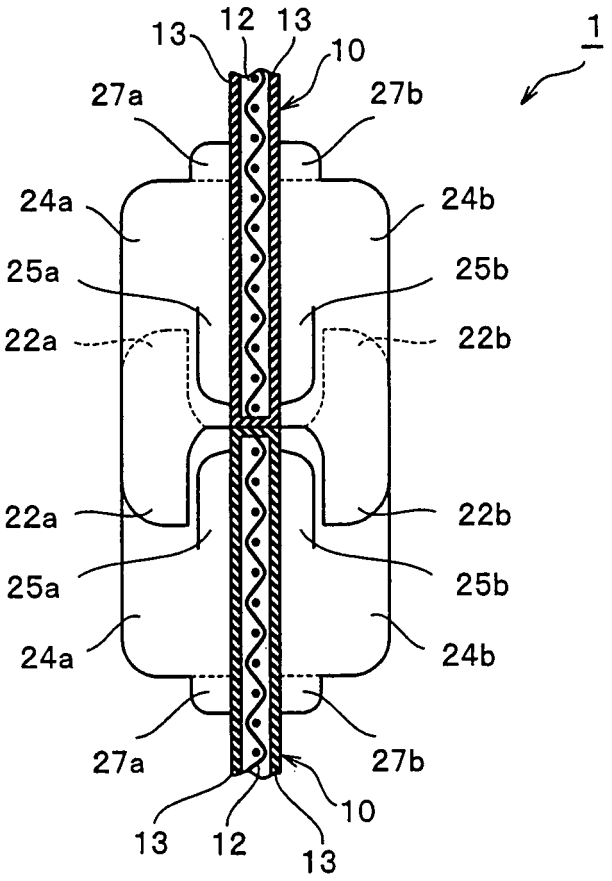
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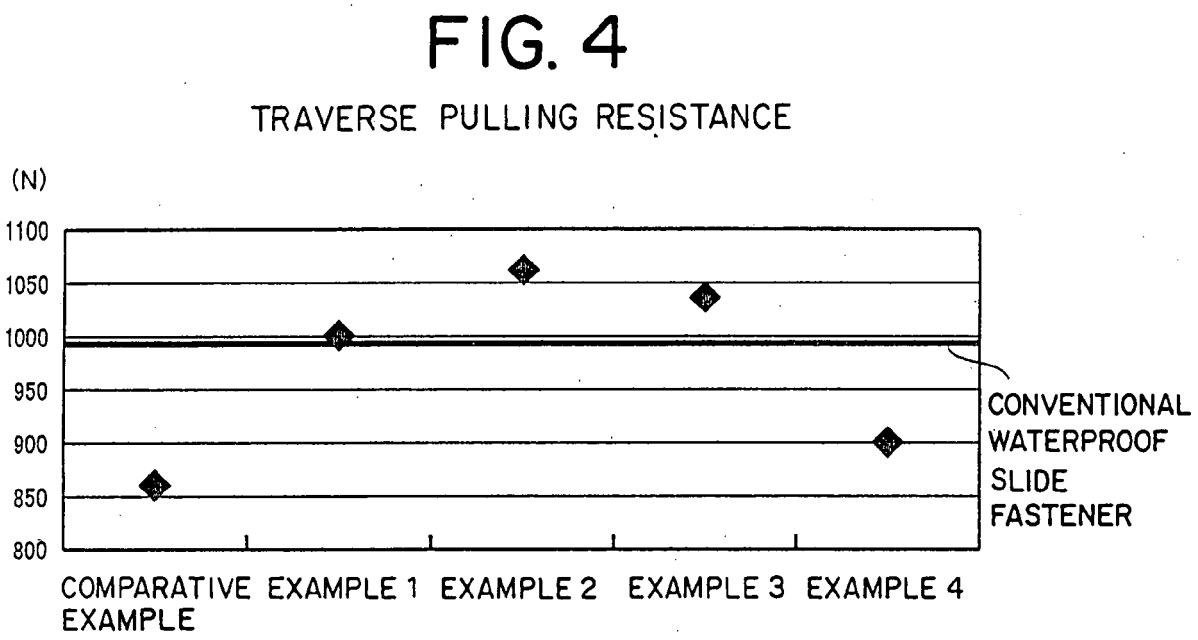
FIG. 4


TRAVERSE PULLING RESISTANCE
(N)
1100
1050
1000
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800
CONVENTIONAL WATERPROOF SLIDE FASTENER
COMPARATIVE EXAMPLE 1
EXAMPLE 2
EXAMPLE 3
EXAMPLE 4
EXAMPLE

FIG. 5

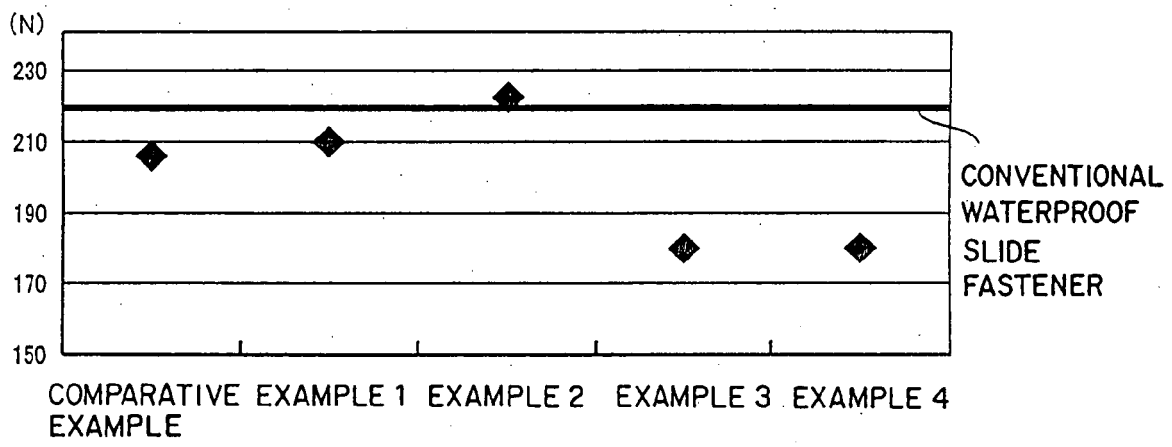

PUSH-UP RESISTANCE
(N)
230
210
190
170
150
CONVENTIONAL WATERPROOF SLIDE FASTENER
COMPARATIVE EXAMPLE 1
EXAMPLE 2
EXAMPLE 3
EXAMPLE 4
EXAMPLE

FIG. 6

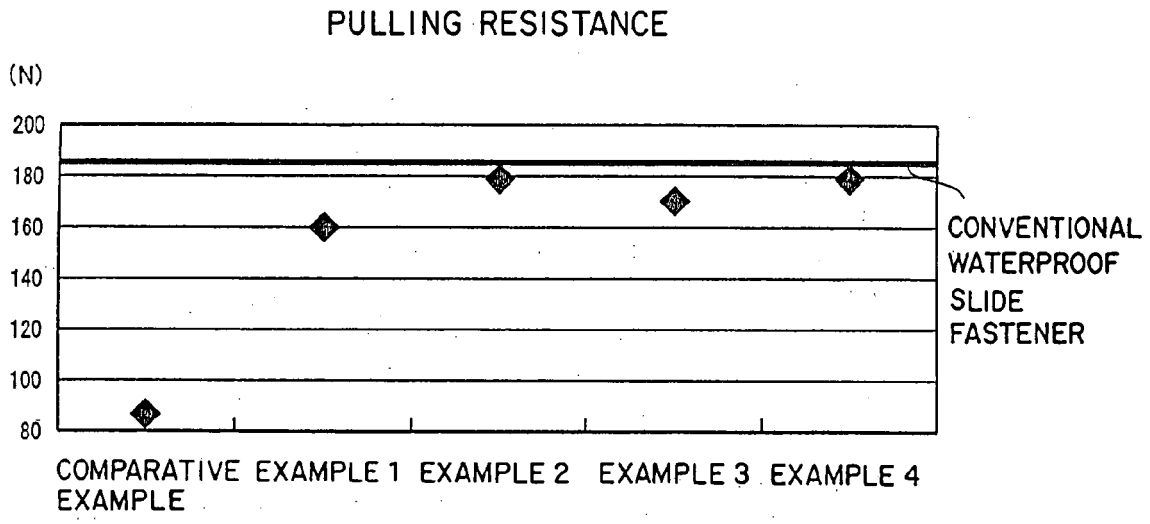
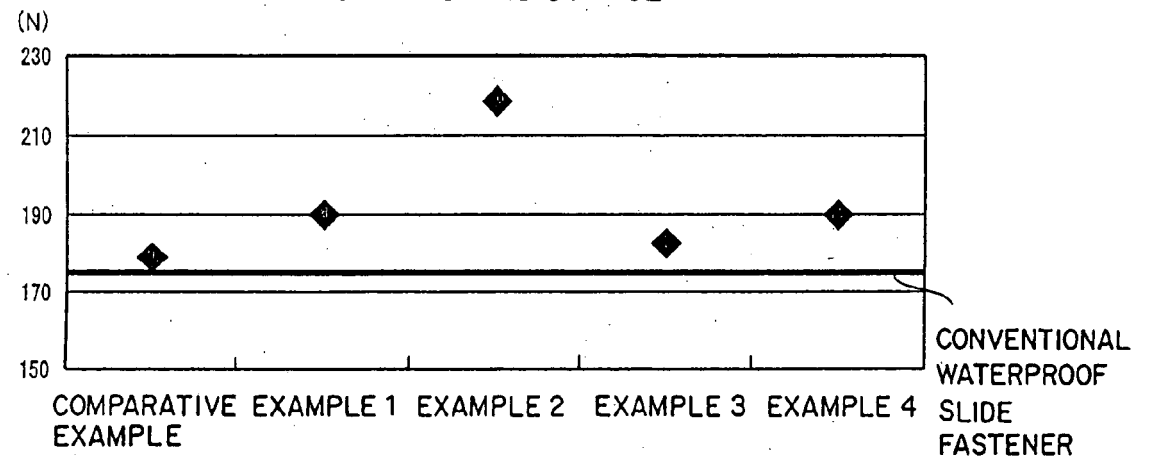

PULLING RESISTANCE
(N)
200
180
160
140
120
100
80
CONVENTIONAL WATERPROOF SLIDE FASTENER
COMPARATIVE EXAMPLE 1
EXAMPLE 2
EXAMPLE 3
EXAMPLE 4
EXAMPLE

FIG. 7


SLIDING RESISTANCE
(N)
230
210
190
170
150
CONVENTIONAL WATERPROOF SLIDE FASTENER
COMPARATIVE EXAMPLE 1
EXAMPLE 2
EXAMPLE 3
EXAMPLE 4
EXAMPLE

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 25 1182

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 1 629 740 A1 (HODER HAROLD [US]; PRESS STUART [US]) 1 March 2006 (2006-03-01) * abstract; figure 1 * -----	1,2	INV. A44B19/32
A	DE 42 12 209 A1 (MEIER REINHARD [DE]) 14 October 1993 (1993-10-14) * claims 1,5; figure 1 * -----	1,2	

TECHNICAL FIELDS SEARCHED (IPC)

A44B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 July 2007	Westermayer, Wilhelm

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

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03-07-2007

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EP 1629740 A1	01-03-2006	NONE	
DE 4212209 A1	14-10-1993	NONE	

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- JP 2005237577 A **[0004] [0006] [0006] [0007] [0008] [0008]**