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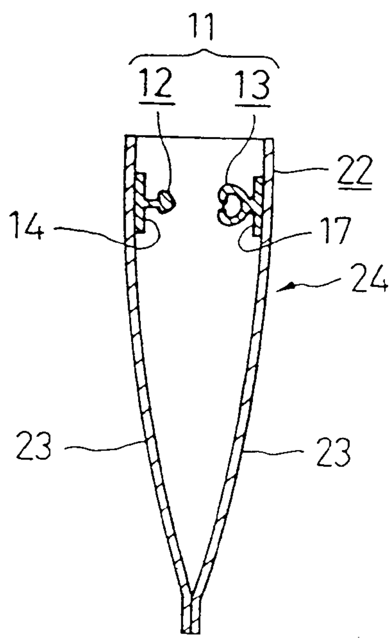
(54) **Snap zipper and bag with the same**

(57) A snap zipper, in which at least a portion to be fused is mainly composed of polybutylene terephthalate (PBT) resin or polyester type elastomer, having a bending modulus of elasticity of 10,000 kg/cm² or below.

F I G. 4



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Description

This invention relates to a snap zipper and a bag with snap zipper, which can be utilized in the fields of foods, medical products and grocery.

Bags with zipper are used in many fields such as those of foods, medical products and grocery. In the bag with snap zipper, a strip-like snap zipper comprising a male and a female member is provided on the bag in a sealing portion thereof. Heretofore, various methods of producing bags with snap zipper have been proposed.

Among the proposed methods, there are (1) one, in which a cylindrical film with a male and a female portion of a snap zipper is extrusion formed as a one-piece molding by using extrusion dies, and (2) one, in which a tape with a snap zipper is produced and is thermally fused to a base film for forming a bag body.

In the former method (1), the bag with snap zipper, which is produced as a one-piece molding from the outset, takes space due to the shape of the snap zipper. Its storage and handling, therefore, are rather inconvenient. In addition, restrictions are imposed on the structure of the base film. Accordingly, the latter method (2) which is free from the above drawbacks is recently becoming a general method.

The snap zipper is usually made of low density polyethylene (LDPE) or polypropylene (PP). In many cases, a sealant layer (which forms the innermost layer of the bag body, and to which the snap zipper is fused), is applied to a base film of the same material. For example, with a base film sealant layer of LDPE, the snap zipper is made of the same LDPE.

With a sealant layer of the same material as the snap zipper, the snap zipper can be sealed to the sealant layer without any trouble.

Meanwhile, polyester resins are excellent in their heat resistance and order retention property, and thus they are used suitably as the material of the sealant layer of the bag body.

However, with a sealant layer of a polyester type resin which is a different material from LDPE or PP of the snap zipper, sufficient adhesion for fusing the snap zipper can not be obtained. Therefore, it has been difficult to use polyester type resins for the sealant layer.

A snap zipper according to a first aspect of the invention features that at least its portion for fusion is made of a material mainly composed of a polyolefin type adhesive resin.

The polyolefin type adhesive resin has a structure, in which a mixture of one or more different varieties of polyolefin are partly graft coupled to an unsaturated carboxylic acid.

Among the polyolefin varieties are low density polyethylene (LDPE), linear low density polyethylene (L-LDPE), high density polyethylene (HDPE), ethylene-vinyl acetate copolymer (EVA), polypropylene (PP), ethylene-butene-1 copolymer, ethylene-propylene copolymer, polybutadiene (PBd), etc.

As the unsaturated carboxylic acid, anhydrous maleic acid is suitably used.

In the snap zipper according to the first aspect of the invention, only the portion for fusion need be mainly composed of a polyolefin type adhesive resin. Of course, the entire snap zipper including the portion for fusion may be mainly composed of a polyolefin type adhesive resin.

A snap zipper according to a second aspect of the invention features that at least its portion for fusion is made of a material mainly composed of polybutylene terephthalate (PBT) or polyester type elastomer and that the resin of the portion for fusion has a bending modulus of elasticity of 10,000 kg/cm^2 or below.

In the snap zipper according to the second aspect of the invention, only the portion for fusion need be mainly composed of the PBT resin or polyester type elastomer. Of course, the entire snap zipper including the portion for fusion may be mainly composed of the PBT resin or polyester type elastomer.

If the bending modulus of elasticity of the resin of the portion for fusion is above 10,000 kg/cm^2, adequate flexibility necessary for the snap zipper can not be obtained. Generally, the lower the bending modulus of elasticity of the resin, the lower is the melting points of the PBT resin and polyester type elastomer, and correspondingly the temperature of fusion to the sealant layer is the lower.

A snap zipper according to a third aspect of the invention features that at least its portion for fusion is made of a material having a composition including (1) polyester type elastomer and a polyolefin type resin and (2) polybutylene terephthalate (PBT) resin and a polyolefin type resin and that the content of the polyolefin type resin in the composition is 3 to 50 % by weight.

In the snap zipper according to the third aspect of the invention, at least the portion for fusion need have the above composition. Of course, the entire snap zipper including the portion for fusion may be composed of (1) polyester type elastomer and a polyolefin type resin and (2) the PBT resin and a polyolefin type resin.

The polyolefin type resin used may be the same polyolefin as used for the snap zipper according to the first aspect of the invention.

The content of the polyolefin type resin in the snap zipper is 3 to 50 % by weight, suitably 10 to 40 % by weight. If the content is below 3 % by weight, the shape retention is deteriorated. If the content is above 50 % by weight, on the other hand, thermal fusion becomes difficult.

The snap zipper may, if necessary, contain suitable additives (such as coloring agent, stabilizing agent, anti-oxidization agent, slip agent, anti-static agent, anti-blocking agent, etc.). Slip agent are added usually.

According to a fourth aspect of the invention, there is provided a bag with snap zipper, in which the snap zipper according to either of the first to third aspects of the invention noted above is fused via the portion for fusion to a bag body.

The snap zipper according to the first to third aspects of the invention permits use of the polyester type resin for the bag body sealant layer, to which the snap zipper is fused. In this case, the snap zipper can be fused to the sealant layer without trouble. Besides, a sufficient strength of fusion between the bag body and the snap zipper is obtainable.

For the snap zipper according to the invention, it is particularly suitable to use the polyester type resin as the material of the sealant layer.

Examples of the polyester type resin are polyester (PET), polybutylene terephthalate (PBT) resin, polyester type elastomer, polycarbonate, etc. It is possible to use a blend resin composed of polyester and polyolefin type resins.

Such polyester type resins are excellent in heat resistance, odor retention and low drug absorption property, with the possibility of using this type of resins as the material of the sealant layer the following effects are obtainable.

Regarding the prior art snap zipper, aluminum has been used as the material of the bag body in order to provide the odor retention and low drug absorption property. However, it is possible to permit cost reduction of the bag body by using polyester type resins in lieu of aluminum. Further, the bag may be made transparent by dispensing with aluminum layer. By so doing, it is possible to obtain a bag, through which the content can be seen while it provides the odor retention and low drug absorption properties.

The bag which can be produced by using such polyester type resin, is suitable for fields, in which heat resistance such as boil and retort is required.

As the material for the sealant layer may be used any resin other than the polyester type resins as well so long as it can be fused to the snap zipper. Examples of such resin are LDPE, L-LDPE, PP, ethylene-vinyl acetate copolymer (EVA), ethylene-methacrylic acid copolymer (EMAA), ionomer (IO), etc.

As the outer layer material, nylon, PET, PP, cellophane, paper, etc. may be used as desired depending on desired characteristics.

The snap zipper according to the invention may be fabricated by any method. Usually, it is produced using extrusion dies having sectional profiles corresponding to its shape for molding it and then cooling the resultant molding in water.

Further, the shape of the snap zipper according to the invention is not limited to what comprises a male and a female member capable of chucking together, and any well-known shape may be adopted so long as it is capable of sealing and unsealing.

The snap zipper may be fused to the bag body with well-known means such as heat, high frequency waves, ultrasonic waves, etc.

In the accompanying drawings:

Fig. 1 is a sectional view showing a male and a female member of an embodiment of the zipper according to the invention in a unchucked state;

Fig. 2 is a sectional view showing the same embodiment of the zipper in the chucked state;

Fig. 3 is a front view showing an embodiment of the bag with snap zipper according to the invention; and

Fig. 4 is a sectional view showing the same embodiment of the bag with the snap zipper according to the invention.

EMBODIMENT 1

A strip-like male and also a strip-like female member 12 and 13 as embodiment of snap zipper 11, as shown in Figs. 1 and 2, were produced by extrusion molding them from a polyolefin type adhesive resin as material resin by using an extruder. As the polyolefin type adhesive resin was used "ADMAR SF700" (a trade name by Mitsui Sekiyu Kagaku C)., Ltd.). The melt flow ratio (MFR), density and Shore hardness (D scale) of "ADMAR SF700" are shown in Table 1 below. The male member 12 is a one-piece molding and has a strip-like stem portion 14, a head portion 15 of a heart-like sectional profile and a connecting portion 16 having a rod-like sectional profile, which connects together the portions 14 and 15.

The female member 13 is also a one-piece molding and has a strip-like stem portion 17 serving as a portion to be fused, and a first and a second semicircular hook portion 18 and 19 formed on the stem portion 17 such that they face each other. The free ends 18A and 19A of the hook portions 18 and 19 define between them a gap 21 which has a width substantially corresponding to the thickness of the connecting portion 16.

In such snap zipper 11, the male and female members 13 and 13 were brought closer, and the head portion 15 of the male member 12 was brought into contact with the hook portions 18 and 19 of the female member 13. Then the hook portions 18 and 19 were pushed apart with the head portion 15, and eventually the hook portion 15 was fitted in between the hook portions 18 and 19, as shown in Fig. 2. The performance of engagement between the male and female members 12 and 13 was evaluated from how these members were engaged. The results are shown in Table 2.

The engagement performance was evaluated as such: It was A (Excellent), i.e., satisfactory, if the male and female members 12 and 13 could be readily engaged. It was B (Good), i.e., common, if the two members could be engaged. It was F (Fail), i.e., defective, if the two members could be difficultly engaged or could not be engaged.

Then, as shown in Figs. 3 and 4, the stem portions 14 and 17 of the make and female members 12 and 13 were thermally fused to respective base films 23 of the bag body 22, and then three sides of the base films 23 were heat sealed, thus obtaining the embodiment of the bag 24 with snap zipper.

The base film 23 had a five-layer structure with four inner layers, i.e., a polyester type resin layer (15 μm), a PET layer (26 μm), a polyester type resin layer (12 μm) and an adhesive layer (5 μm), and an outer layer, i.e., a PET layer (12 μm). The innermost polyester type resin layer served as the sealant layer of the bag body 22, to which the male or female member 12 or 13 was fused.

The thermal fusion temperature in Table 2 indicates a mechanical strength of 300 g per 15 mm of width. It was measured by using a thermal gradient tester ("HG-100" by Toyo Seiki Co., Ltd.).

The performance of thermal fusion between the zipper 11 and base film 23 was evaluated. The result is shown in Table 2.

The thermal fusion performance was evaluated as follows. It was A, i.e., satisfactory, if a strength of 300 g or above with a width of 15 mm was measured by using the thermal gradient tester noted above. It was F, i.e., defective, if the strength in the same measurement was below 300 g.

In the column of the overall evaluation in Table 2, B indicates that both the thermal fusion and engagement performances are B, and F indicates that at least either the thermal fusion or the engagement performance is F.

EMBODIMENTS 2 to 4

Like the Embodiment 1, the individual embodiments of snap zipper 11 were produced by using polyolefin type adhesive resin. Then bags 24 with snap zipper according to the individual embodiments were produced by using the respective zippers 11.

As the polyolefin type adhesive resin of the snap zipper, "ADMAR SF170", "ADMAR SE800" and "ADMAR SE810" (trade names by Mitsui Sekiyu Kagaku CO., Ltd.) were used in the respective embodiments. The characteristics of these resins are as shown in Table 1.

As in Embodiment 1, the evaluation of the performance of engagement between the male and female members 12 and 13, measurement of the temperature of thermal fusion between the zipper 11 and base film 23 and the evaluation of the thermal fusion performance were made. The results are shown in Table 2.

COMPARATIVE EXAMPLES 1 TO 5

Like the Embodiment 1, the individual embodiments of snap zipper 11 were produced. Then bags with snap zipper according to the individual comparative examples were produced by using the respective zippers. Incidentally, the used materials for zippers are shown in Table 2.

As in Embodiment 1, the evaluation of the performance of engagement between the male and female members, measurement of the temperature of thermal fusion between the zipper and base film and the evaluation of the thermal fusion performance were made. The results are shown in Table 2.

TABLE 1

	SF700	SF710	SE800	SE810
MFR190°C(g/10min)	1.0	3.4	4.4	7.2
DENSITY(g/cm^3)	0.88	0.90	0.90	0.89
SHORE HARDNESS(D scale)	16	36	33	18

TABLE 2

	NAME OF RESIN	ENGAGEMENT PERFORMANCE	THERMAL FUSION TEMPERATURE	THERMAL FUSION PERFORMANCE	OVERALL EVALUATION
EMBODIMENT 1	SF700	B	115° C	B	B

TABLE 2 (continued)

	NAME OF RESIN	ENGAGEMENT PERFORMANCE	THERMAL FUSION TEMPERATURE	THERMAL FUSION PERFORMANCE	OVERALL EVALUATION
EMBODIMENT 2	SF710	B	118° C	B	B
EMBODIMENT 3	SE800	B	105° C	B	B
EMBODIMENT 4	SE810	B	102° C	B	B
COMPARATIVE EXAMPLE 1	LDPE	B	-	F	F
COMPARATIVE EXAMPLE 2	L-LDPE	B	-	F	F
COMPARATIVE EXAMPLE 3	EVA	B	-	F	F
COMPARATIVE EXAMPLE 4	PP	B	-	F	F

Since the snap zippers 11 in Embodiments 1 to 4 are made of polyolefin type adhesive resin, they are satisfactorily flexible, excellent in the performance of sealing and unsealing of the male and female members 12 and 13 (engagement performance) and satisfactory in appearance.

Also, with the snap zippers of these embodiments satisfactory fusion can be ensured even if the sealant layer of the base film 23 of the bag body 24 is of a different material (polyester type resin) from that of the snap zipper 11, that is, the adhesion between the snap zipper 11 and sealant layer is satisfactory.

Further, since the temperature of fusion to the sealant layer is comparatively low, the fusion can be readily attained. Thus, it is possible to increase the productivity. In addition, it is possible to obtain bag 24 with snap zipper 11 which has satisfactory appearance.

With zippers in Comparative Examples 1 to 4, which are made of LDPE, EVA or PP resin other than polyolefin type adhesive resin, the fusion performance is defective although the engagement performance is satisfactory.

Embodiments 5

A strip-like male and a strip-like female member 12 and 13 of the snap zipper 11 in these embodiments, as shown in Figs. 1 and 2, were produced by extrusion molding using PBT as material resin with an extruder, followed by water cooling. These members were taken up on into rolls. The bending modulus of elasticity of the PBT resin was 3,500 kg/cm^2.

Of these snap zippers 11, the flexibility and engagement performance were evaluated. Further, the thermal fusion temperature was measured. The results are shown in Table 3.

The flexibility was evaluated with respect to the state of take-up of the male and female members 12 and 13. The evaluation standards were as follows. The flexibility was A (Excellent), i.e., satisfactory, if the rolls of the taken-up male and female members 12 and 13 were satisfactory in appearance. It was B (Good), i.e., common, if the rolls were rather satisfactory in appearance. It was F (Fail), i.e., defective, if the rolls were unsatisfactory in appearance.

As for the engagement performance, the method and standards of evaluation were as in Embodiment 1.

The method of measurement of the thermal fusion temperature was also as in Embodiment 1.

Then, as shown in Figs. 3 and 4, the stem portions 14 and 17 of the male and female members 12 and 13 were thermally fused to base films 23 (70 µm thick) of the bag body 22, and then three sides of the films were heat sealed, thus obtaining the bag 24 with snap zipper in these embodiments.

The base film 23 had a five-layer structure having four inner layers, i.e., a polyester type resin layer (15 µm), a PET layer (26 µm), a polyester type resin layer (12 µm) and an adhesive layer (5 µm) and an outer layer, i.e., a PET layer (12 µm). The innermost polyester type resin layer was the sealant layer of the bag body 22, to which the male or female member 12 or 13 was fused.

EMBODIMENTS 6 TO 7

Like the Embodiment 5, the individual embodiments of PBT snap zipper 11 were produced. Then bags with snap zipper 24 according to the individual embodiments were produced by using the respective zippers.

Incidentally, the bending modulus of elasticity of the PBT resin are shown in Table 3.

Of these snap zippers 11, the flexibility and engagement performance were evaluated as Embodiments 5. Further, the thermal fusion temperature was measured. The results are shown in Table 3.

COMPARATIVE EXAMPLES 5 TO 9

Like the Embodiment 1, the individual comparative examples of snap zipper were produced. Then bags with snap zipper according to the individual comparative examples were produced by using the respective zippers. Incidentally, the kinds and the bending modulus of elasticity of the used resin are shown in Table 3.

Of these snap zippers, the flexibility and engagement performance were evaluated as Embodiments 5. Further, the thermal fusion temperature was measured. The results are shown in Table 3.

TABLE 3

		RESIN	BENDING MODULUS OF ELASTICITY	FLEXI-BILITY	THERMAL FUSION TEMPER-ATURE	ENGAGE-MENT PERFOR-MANCE
EMBOD-IMENTS	5	PBT	$3500\ kg/cm^2$	A	182°C	A
	6	PBT	$7000\ kg/cm^2$	A	190°C	A
	7	PBT	$10000 kg/cm^2$	B	198°C	B
COM. EXAM. *	5	PBT	$15000 kg/cm^2$	F	210°C	F
	6	PBT	$25000 kg/cm^2$	F	227°C	F
	7	PBT	$45000 kg/cm^2$	F	235°C	F
	8	LDPE	-	-	DEFECTIVE THERMAL FUSION PERFOR-MANCE	A
	9	PP	-	-	DEFEC-TIVE THERMAL FUSION PERFOR-MANCE	A

* is COMPARATIVE EXAMPLES

Since the snap zippers 11 in Embodiments 5 to 7 are made of PBT resin having the bending modulus of elasticity of more than 10000 kg/cm^2, they are satisfactorily flexible, excellent in the performance of sealing and unsealing of the male and female members 12 and 13 (engagement performance) and satisfactory in appearance.

Also, with the snap zippers of these embodiments satisfactory fusion can be ensured even if the sealant layer of the base film 23 of the bag body 24 is of a different material (polyester type resin) from that of the snap zipper 11, that is, the adhesion between the snap zipper 11 and sealant layer is satisfactory.

Further, since the temperature of fusion to the sealant layer is comparatively low, the fusion can be readily attained. Thus, it is possible to increase the productivity. In addition, it is possible to obtain bag 24 with snap zipper 11 which has satisfactory appearance.

With zippers in Comparative Examples 5 to 7, which are made of PBT resin, the flexibility and the engagement performance is not satisfactory and the fusion temperature is rather high since the bending modulus of elasticity is over 10000 kg/cm^2.

With zippers in Comparative Examples 8 to 9, which are made of LDPE or PP resin, the fusion performance is defective although the engagement performance is satisfactory.

Embodiments 8 to 12

Like the Embodiment 5, the individual embodiments of snap zipper 11 made of polyester type elastomer were produced. Then bags with snap zipper according to the individual Embodiments were produced by using the respective zippers.

In Embodiment 8 as polyester type elastomer was used "PELPRENE" (a trade name by Toyo Boseki Co., Ltd.), and in Embodiments 9 to 12 as polyester type elastomer was used "HYTREL" (a trade name by DUPONT-TORAY CO., Ltd.).

The bending modulus of elasticity and the melting point of the polyester type elastomer are shown in Table 4.

Of these snap zippers 11, the flexibility and engagement performance were evaluated as Embodiments 5. Further, the thermal fusion temperature was measured. The results are shown in Table 4.

COMPARATIVE EXAMPLES 10 - 12

Like the Embodiment 5, the individual embodiments of snap zipper were produced. Then bags with snap zipper according to the individual comparative examples were produced by using the respective zippers.

Incidentally, the bending modulus of elasticity and the melting point of the resin are shown in Table 4.

Of these snap zippers, the flexibility and engagement performance were evaluated as Embodiments 5. Further, the thermal fusion temperature was measured. The results are shown in Table 4.

TABLE 4

		RESIN	BENDING MODULUS OF ELASTICITY	MELTING POINT	FLEXI-BILITY	THERMAL FUSION TEMPERA-TURE	ENGAGEMENT PERFORM-ANCE
EMBODIMENTS	8	PELPRENE P-150MS	1200 kg/cm²	170° C	B	146° C	A
	9	HYTREL 4767	1100 kg/cm²	199° C	B	154° C	A
	10	HYTREL 6347	3960 kg/cm²	215° C	A	200° C	A
	11	HYTREL 7247	6050 kg/cm²	219° C	A	196° C	A
	12	HYTREL 2571	9500 kg/cm²	225° C	B	163° C	B
COMPARATIVE EXAMPLES	10	HYTREL 2751	12800kg/cm²	227° C	F	202° C	F
	11	LDPE	-	-	-	DEFECTIVE THERMAL FUSION PERFORM-ANCE	A
	12	PP	-	-	-	DEFECTIVE THERMAL FUSION PERFORM-ANCE	A

With the snap zippers 11 in Embodiments 8 to 12, which are made of polyester type elastomers with a bending modulus of elasticity of 10,000 kg/cm^2 or below, it is possible to obtain the same effects as in Embodiments 5 to 7 using PBT resin. The same effects can also be obtained with the bags 24 with snap zipper 11.

With the zipper in Comparative Example 10, which is made of polyester type elastomer, the bending modulus of elasticity is above 10,000 kg/cm^2. The flexibility and engagement performance are defective. Besides, the thermal fusion temperature is comparatively high.

With the zippers in Comparative Examples 11 and 12, which are made of LDPE or PP resin, the thermal fusion performance is defective although the engagement performance is satisfactory.

EMBODIMENTS 13 to 28

A strip-like male and a strip-like female member 12 and 13 of each of snap zippers 11 in the individual embodiments, as shown in Figs. 1 and 2, were produced by extrusion molding using a material, which was composed of polyester type elastomer as a main material and polyolefin type resin as an auxiliary material, with an extruder, followed by water cooling. The kinds and proportions of the polyolefin type resins that were used in the individual embodiments are as in Table 5.

The shape retention of the snap zippers 11 of the individual embodiments was evaluated. Also, the heat seal temperature was measured. The results are shown in Table 5.

The shape retention was evaluated such that the snap zipper 11 was B (Good) if it was satisfactory in the shape of the head portion 15 and hooks 18 and 19 and substantially free from twist in the stem portions (tape portions) 14 and 17, C (Fairly Good) if it had slight twist in the stem portions 14 and 17, and F (Fail) if it had much twist in the stem portions 14 and 17.

The heat seal temperature was measured in the same way as above.

In the evaluation column in the Table, B stands for a snap zipper, which is B or C in the shape retention and a heat seal strength of 15 mm width of 300 g or above, and F stands for a zipper, which is C or F in the shape retention and has a heat seal strength of 15 mm width of 300 g or below.

As shown in Figs. 3 and 4, the stem portions 14 and 17 of the male and female members 12 and 13 were then heat sealed to base films (70 μm thick) 23 of the bag body 22, and then the base films were heat sealed on three sides, thus obtaining the bag 21 with snap zipper in these embodiments.

The base film 23 had a three-layer structure with two inner layers, i.e., a polyester type resin layer (53 μm) and an adhesive layer (5 μm) and an outer layer, i.e., PET layer (12 μm), the innermost polyester type resin layer being a sealant layer of the bag body 22, to which the male or female 12 or 13 was fused.

The product manes and manufacture companies of the main and auxiliary materials used in the embodiments and comparative embodiments are as follows.

Polyester type elastomer: One-to-one blend of "HYTREL 6347" and "HYTREL 2551"
PBT resin: "BZ11" (by DUPONT-TORAY Co., Ltd.)
LDPE: "ACEPOLYETHY F151" (by Acepolymer Co., Ltd.)
L-LDPE: "MORETECH 0368R" (by Idemitsu Sekiyu Kagaku Co., Ltd.)
HDPE: "IDEMITSU POLYETHYLENE 540B" (by Idemitsu Sekiyu Kagaku Co., Ltd.)
PP: "IDEMITSU POLYPRO F-205S" (by Idemitsu Sekiyu Kagaku Co., Ltd.)

COMPARATIVE EXAMPLES 13 to 17

As in Embodiments 13 to 28, snap zippers in the individual comparative examples were produced. Then, by using these zippers bags with zipper in the individual comparative examples were produced.

The kinds and proportions of the polyolefin type resins used in the individual comparative examples are shown in Table 5.

As in the above embodiments, the shape retention of the snap zipper of the individual comparative examples were evaluated. Also, the heat seal temperature was measured. The results are shown in Table 5.

TABLE 5

		MAIN MATERIAL	KINDS AND PROPORTIONS OF THE MAIN AND AUXILIARY MATERIALS (wt%)		SHAPE RETENTION	HEAT SEAL TEMPERATURE	EVALUATION
*	13	POLYESTER TYPE ELASTOMER	LDPE	3	C	180°C	B
	14		LDPE	10	B	185°C	B
	15		LDPE	20	B	190°C	B
	16		LDPE	40	B	250°C	B
*	17	POLYESTER TYPE ELASTOMER	L-LDPE	3	C	179°C	B
	18		L-LDPE	10	B	168°C	B
	19		L-LDPE	20	B	165°C	B
	20		L-LDPE	40	B	207°C	B
*	21	POLYESTER TYPE ELASTOMER	HDPE	3	C	182°C	B
	22		HDPE	10	B	175°C	B
	23		HDPE	20	B	170°C	B
	24		HDPE	40	B	156°C	B
*	25	POLYESTER TYPE ELASTOMER	PP	3	C	185°C	B
	26		PP	10	B	195°C	B
	27		PP	20	B	218°C	B
	28		PP	40	B	233°C	B
**	13	POLYESTER TYPE ELASTOMER	NONE	0	F	185°C	F
	14		LDPE	80	C	F	F
	15		L-LDPE	80	C	F	F
	16		HDPE	80	C	F	F
	17		PP	80	C	F	F

* is EMBODIMENTS
** is COMPARATIVE EXAMPLES

EMBODIMENTS 29 TO 44

A strip-like male and a strip-like female member of each of snap zippers in the individual embodiments were produced by using a material, which was composed of polybutylene terephthalate as a main material and polyolefin type resin as an auxiliary material as Embodiments 13 to 28. Then, by using these zippers bags with zipper in the individual Embodiments were produced.

The kinds and proportions of the polyolefin type resins that were used in the individual embodiments are as in Table 6.

The shape retention of the snap zippers 11 of the individual embodiments was evaluated. Also, the heat seal temperature was measured. The results are shown in Table 6.

COMPARATIVE EXAMPLES 18 TO 21

As in Embodiments 29 to 44, snap zippers in the individual comparative examples were produced. Then, by using these zippers bags with zipper in the individual comparative examples were produced.

The kinds and proportions of the polyolefin type resins used in the individual comparative examples are shown in Table 6.

As in the above embodiments, the shape retention of the snap zipper of the individual comparative examples were evaluated. Also, the heat seal temperature was measured. The results are shown in Table 6.

TABLE 6

		MAIN MATERIAL	KINDS AND PROPORTIONS OF THE MAIN AND AUXILIARY MATERIALS (wt%)		SHAPE RETENTION	HEAT SEAL TEMPERATURE	EVALUATION
*	29	POLYBUTYLENE TEREPHTHALATE	LDPE	3	B	182°C	B
	30		LDPE	10	B	195°C	B
	31		LDPE	20	B	210°C	B
	32		LDPE	40	B	214°C	B
*	33	POLYBUTYLENE TEREPHTHALATE	L-LDPE	3	B	180°C	B
	34		L-LDPE	10	B	173°C	B
	35		L-LDPE	20	B	162°C	B
	36		L-LDPE	40	B	148°C	B

*	37	POLYBUTYLENE TEREPHTHALATE	HDPE	3	B	185°C	B
	38		HDPE	10	B	180°C	B
	39		HDPE	20	B	175°C	B
	40		HDPE	40	B	161°C	B
*	41	POLYBUTYLENE TEREPHTHALATE	PP	3	B	185°C	B
	42		PP	10	B	181°C	B
	43		PP	20	B	170°C	B
	44		PP	40	B	163°C	B
**	18	POLYBUTYLENE TEREPHTHALATE	LDPE	80	C	F	F
	19		L-LDPE	80	C	F	F
	20		HDPE	80	C	F	F
	21		PP	80	C	F	F

* is EMBODIMENTS
** is COMPARATIVE EXAMPLES

From Tables 5 and 6, it will be seen that in the snap zipper 11 in each of Embodiments 13 to 28, in which the male and female members 12 and 13 are made of a material composed of (1) polyester type elastomer and polyolefin type resin, or (2) polybutylene terephthalate resin and polyolefin type resin, the composition containing 3 to 50 % by weight of the polyolefin type resin, the stem portions (tape portions) 14 and 17 of the male and female members 12 and 13 have only very slight twist, thus indicating satisfactory shape retention.

Also, it will be seen that these bags 24 twist snap zippers 11 have no problem in the fusion strength between the snap zippers 11 and bag body 22. Thus, the bag body 24 is excellent in the sealing and unsealing of the snap zipper 11 and is satisfactory in appearance.

The snap zipper in Comparative Example 13 had defective shape retention because it did not contain polyolefin type resin although it contained polyester type elastomer.

The snap zippers in Comparative Examples 14 to 17 had some twist in the stem portion (tape portion) because their polyolefin type resin, although contained, exceeded the scope according to the invention in the content. Further, bags with snap zipper produced by using these snap zippers had problems in the mechanical strength of fusion between the snap zipper and bag body.

The snap zippers in Comparative Examples 18 to 21 had some twist in the stem portion because their polyolefin type resin content exceeded the scope according to the invention although they contained polybutylene terephthalate resin and polyclefin type resin. In addition, in this case the bag with snap zipper had problems in the fusion strength between the snap zipper and bag body.

As has been shown in the above embodiments, with the snap zipper and the bag with snap zipper according to the invention it is possible to obtain fusion of the snap zipper to the polyester type resin sealant of the bag body without any trouble and also obtain sufficient mechanical strength of fusion.

Claims

1. A snap zipper, in which at least a portion to be fused is mainly composed of polybutylene terephthalate (PBT) resin or polyester type elastomer, having a bending modulus of elasticity of 10,000 kg/cm^2 or below.

2. A bag, to which a snap zipper according to claim 1, has been fused.

FIG. 1

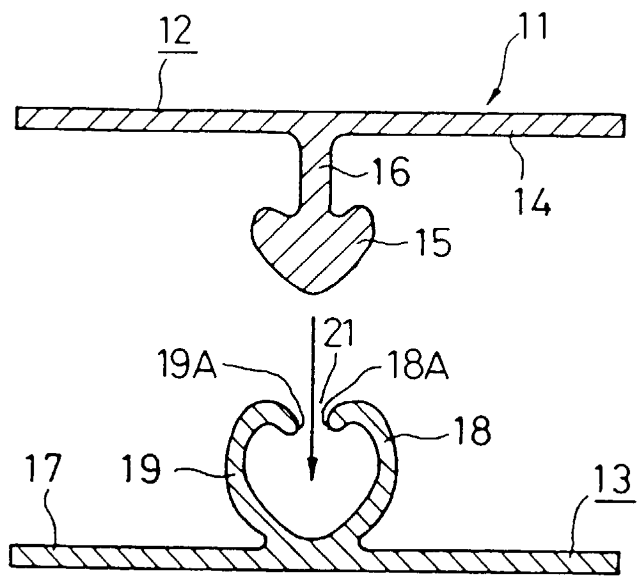

FIG. 2

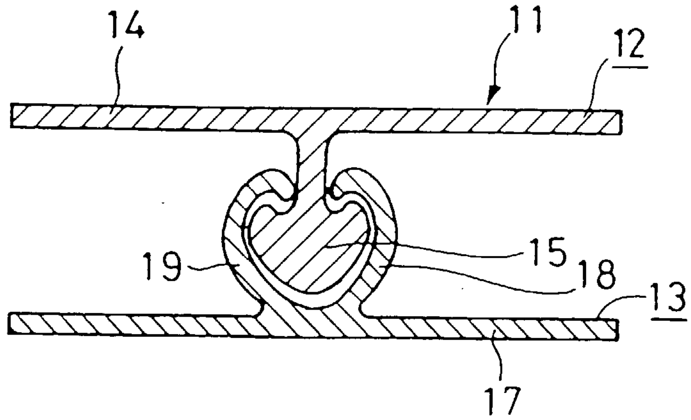

FIG.3

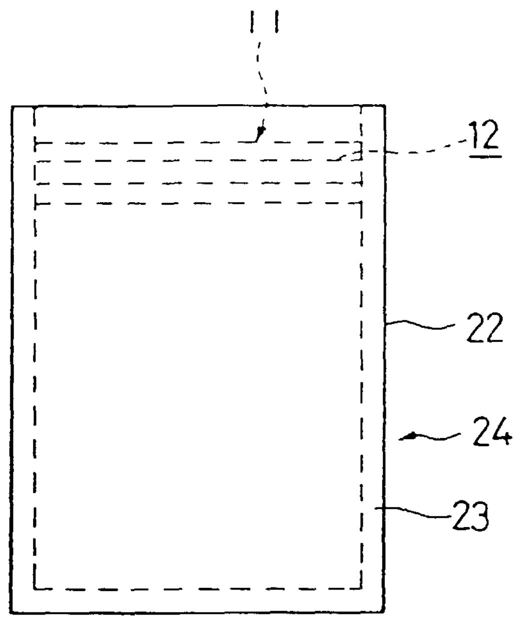

FIG.4