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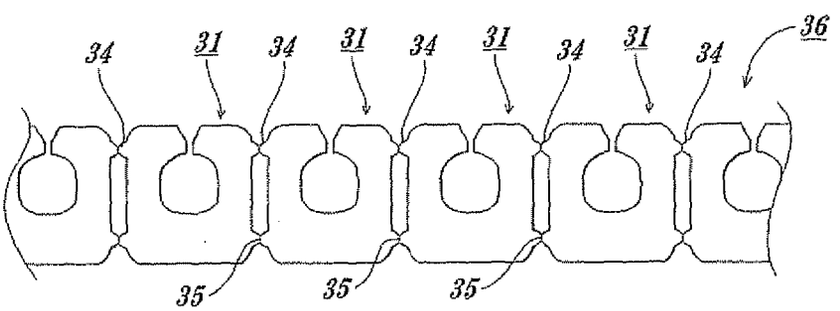
(54) BINDER, AND BINDER CONNECTING BAND

(57) The present invention provides a closure having a closing function and reclosability that is gentle on the hands of consumers and can have a low environmental impact. The invention also provides a closure whereby the connection parts in a band of connected closures are resistant to the influences of humidity changes. The present invention is a closure having a closing function and reclosability, formed of a composite layer having a layer made of paper, and provided with a closure hole, provided in substantially a center, for closing an object to be closed, as well as an opening that is smaller than the closure hole provided at one end, the opening communicating with the closure hole. Preferably this closure comprises a synthetic resin layer laminated between two layers of paper.

FIG. 3



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Description

TECHNICAL FIELD

[0001] The present invention relates to a closure for closing and binding the neck of a bag containing food, agricultural products or the like, and to a band of connected closures that are connected directly to one another.

BACKGROUND ART

[0002] Conventional closures are disclosed for example in Patent Document 1, Patent Document 2, Patent Document 3, Patent Document 4 and Patent Document 5.
These conventional closures are generally formed from plastic resin. For example, Patent Document 4 discloses a sheet consisting of an elastic synthetic resin material such as polypropylene, polyethylene, polyvinyl chloride, nylon or the like (see Patent Document 4, paragraph [0006]).
When such a closure has connection parts, fragments may break off when the closure is detached, and may cause contamination. This can also cause burr, which has been known to damage the hands.
[0003] The material used in the present invention is thick paper or paperboard, which is gentler on the hands of the user (consumer), and which may also reduce environmental load when the paper is made of plant material. Using thick paper also allows for the use of recycled pulp. It is also possible to inhibit the occurrence of fragments when a band of connected closures is cut apart.
[0004] Continuous closing machines are generally used for the actual closing, and the closures used in this case are in the form of a band of connected closures connected in a line.
Such a band of connected closures connected in a line is rolled and loaded into a compartment in the closing machine, and the closures are fed one by one from the compartment during closing. The closures being fed from the machine are detached at roughly the same time as they are clipped around an object to be closed.
That is, in the case of closing using an existing continuous closing machine, the connection parts need to be strong enough that they do not break even if pull force is applied in the feed direction of the closures, but must also be easy to detach when closing an object to be closed.

Patent Document 1: Japanese Patent Application Laid-open No. 2001-80654
Patent Document 2: Japanese Patent Application Laid-open No. 2000-179510
Patent Document 3: Japanese Patent Application Laid-open No. 2001-2092
Patent Document 4: Japanese Patent Application Laid-open No. H10-59334
Patent Document 5: Japanese Patent Application Laid-open No. S57-96954

DISCLOSURE OF THE INVENTION

PROBLEMS THAT THE INVENTION IS TO SOLVE

[0005] It is an object of the present invention to provide a closure which is gentle on the hands of the user (consumer), and which can be easily reused.
Another object is to provide a closure that is made moisture-resistant by lamination of synthetic resin and/or biodegradable resin, giving it excellent storability and machine operability in a continuous closing machine.
Another object is to provide a closure whereby occurrence of paper dust can be suppressed by laminating a synthetic resin and/or biodegradable resin.
Still another object is to provide a closure that has a smaller environmental impact than conventional closures.

MEANS FOR SOLVING THE PROBLEMS

[0006]

(1) The present invention is a closure having a closing function and reclosability, which is formed of a single paper layer or a composite layer having at least a layer formed of paper, and which has a closure hole, provided substantially in a center part, for closing an object to be closed, and which is further formed with, at one end, an opening smaller than the closure hole, the opening communicating with the closure hole.
The raw material of the layer of paper that forms the principal layer of the present invention is plant fiber, cellulose acetate or the like. Colorants, sizing agents, clay and other fillers can also be added thereto. (2) The closure having a closing function and reclosability according to (1) above, having, on side faces of the closure, detachable connection

parts that are connected to other closures adjacent thereto that are in a line with the closure, when the closure and the other closures are formed as a band of connected closures.

[0007]

(3) The closure according to (1) or (2) above, wherein the closure is formed of a composite layer having at least a layer formed of paper, and wherein at least one of layer or layers other than the paper layer is formed from synthetic resin and/or biodegradable resin.

Synthetic resin here means a synthetic polymer substance such as a thermoplastic resin or thermosetting resin. Examples include polyvinyl chloride, polystyrene, polypropylene, polyethylene, methacrylic resin, polycarbonate, polyamide, phenol resin, unsaturated polyester resin, alkyd resin, epoxy resin and the like.

A biodegradable resin is a resin containing mainly biodegradable materials, which decompose by the action of microorganisms.

Examples of raw materials that are biodegradable include biodegradable resins having plant-derived components and biodegradable resins having petroleum-derived components. A mixture of a biodegradable resin having plant-derived components with a biodegradable resin having petroleum-derived components may also be used.

Examples of plant-derived components include polylactic acid, polycaprolactam, polyvinyl alcohol, casein, glycerin fatty acid esters, soft polylactic acid compounds compounded from polylactic acid and palm oil containing glycerin fatty acid esters, polylactic acid/diol-dicarboxylic acid copolymer, starch-polyester resin and the like.

Starch-polyester resin does not undergo blocking when molded and worked into a film, and also has a blocking-prevention effect when blended with other resins, as well as having good welding properties, printing properties and durability.

Examples of petroleum-derived components include PET (polyethylene terephthalate) and a polybutylene adipate/terephthalate copolymer resin which is an aliphatic-aromatic copolyester resin having a structure based on module units consisting of terephthalic acid/butanediol adipic acid.

In particular, a closure with low environmental impact can be provided by means of a composite layer that combines a paper layer with a layer mainly made of a biodegradable resin.

(4) The closure according to (3) above, wherein the layer formed from the synthetic resin and/or biodegradable resin includes an oriented film.

Examples of the oriented film here include uniaxially oriented films and biaxially oriented films. This is a polyethylene or other polymer material that has been physically stretched in order to improve the strength and heat resistance of the film. Uniaxially oriented films have the property of being difficult to stretch in either the vertical or horizontal direction. Biaxially oriented films are materials that are difficult to stretch both vertically or horizontally.

[0008]

(5) The closure according to (3) or (4) above, wherein the closure is formed of a composite layer comprising layers made of paper that are laminated on both surfaces of the layer of synthetic resin and/or biodegradable resin.

The resin layer here may be a single layer or a composite of two or more layers.

(6) The closure according to (3) or (4) above, wherein the closure is formed of a composite layer comprising the layers of synthetic resin and/or biodegradable resin laminated on both sides of the layer of paper.

The layers of synthetic resin and/or biodegradable resin in this case may be each a single layer or a composite of two or more layers.

(7) The closure according to any one of (3) to (6) above, wherein the layer of synthetic resin and/or biodegradable resin is formed from any one of olefin resin, polyethylene terephthalate (PET), polystyrene (PS), acrylonitrile (AN) and PVA (polyvinyl alcohol).

[0009]

(8) The closure according to any one of (1) to (7) above, wherein one or more notches are formed in the connection parts of the closure from one or both surfaces thereof towards an inner layer.

(9) The closure according to any one of (3) to (8) above, wherein only the layer made of paper in the connection parts of the closure is severed.

By severing the layer of paper and forming the connection part only from those layers consisting of synthetic resin and/or biodegradable resin, it is possible to provide a closure with reduced detachment strength, and to inhibit the occurrence of paper dust.

(10) The closure according to any one of (1) to (9) above, wherein the weight per unit area of the paper (hereunder, also called the "basis weight") is 400 to 1000 g/m^2.

If the weight per unit area of the paper is less than 400 g/m^2, it will not be strong enough to function properly as a closure, while if the weight exceeds 1000 g/m^2 the narrow opening will be difficult to open, and may not be sufficiently reclosable.

(11) The closure according to any one of (1) to (9) above, wherein the average length of fibers making up the paper is 1.0 mm to 4.0 mm.

If the average of the fiber lengths making up the paper is less than 1.0 mm, it will not maintain sufficient stiffness to function as a closure, while if the fiber lengths exceed 4.0 mm, the connection part will be difficult to sever.

[0010]

(12) The closure according to any one of (1) to (11) above, wherein ink or a coating material is printed or coated on the surface of the closure.

(13) A band of connected closures formed by connecting the closures according to any one of (2) to (12) above in a line by means of the adjacent connection parts of the closures.

(14) A package product wherein the object is closed using the closure according to any one of (1) to (12) above.

EFFECTS OF THE INVENTION

[0011] By adopting the constitution of the present invention it is possible to provide a closure having a closing function and reclosability that is easy for users and reusable.

Moreover, the effect of providing a closure that is resistant to the influences of humidity changes while having excellent machine operability in a continuous closing machine is achieved by laminating a synthetic resin and/or biodegradable resin.

Furthermore, the effect of suppressing the occurrence of paper dust is also achieved by laminating a synthetic resin and/or biodegradable resin.

Another effect is to provide a closure that has less of an environmental impact than conventional closures.

BEST MODE FOR CARRYING OUT THE INVENTION

[0012] One example of an embodiment of the closure of the present invention is given below. The embodiment shown below is an example of the present invention, and the present invention is not limited to the embodiment described below. Figure 1 is a plane view showing a closure of an embodiment according to the present invention. Figure 1 only illustrates an embodiment of a closure of the present invention, and the form of the present invention is not limited thereby.

The closure 1 of this embodiment is formed of a composite layer having one layer of thick paper. As shown in Figure 1, the closure 1 of this embodiment has closure hole 2, roughly in the center of the plane view, for closing a bag or other object to be closed. An opening 3, which communicates with and is smaller than closure hole 2, is formed at one end of the closure. The closure also has detachable connection parts 4, 4... on the side faces, which connect the closure in a line to other adjacent closures when the closure and the other closures are connected as a band of connected closures.

[0013] Figure 2 shows cross-sections along line II-II in Figure 1 illustrating the layered structure of the closure 1 of this embodiment. The layered structures shown here are illustrative, and the layered structure of the present invention is not limited thereby.

The closure 1 shown in Figure 2(a) has a three-layer structure comprising paper (11), synthetic resin (12) and paper (13) in that order from the top. The synthetic resin here is preferably polyethylene terephthalate or polyethylene. The closure 1 shown in Figure 2(b) has a three-layer structure comprising synthetic resin (14), paper (15) and synthetic resin (16) from top to bottom. The closure 1 shown in Figure 2(c) has a five-layer structure comprising polyethylene terephthalate (17), polyethylene (18), paper (19), polyethylene (20) and polyethylene terephthalate (21) from top to bottom. The closure 1 shown in Figure 2(d) has a four-layer structure comprising polyethylene terephthalate (22), polyethylene (23), paper (24) and polyethylene terephthalate (25) from top to bottom. The closure 1 shown in Figure 2(e) has a two-layer structure comprising polyethylene terephthalate (26) and paper (27) from top to bottom. The closure 1 shown in Figure 2(f) has a three-layer structure comprising polyethylene terephthalate (28), polyethylene (29) and paper (30) from top to bottom. Figure 2(g) is a cross-section of a closure with a single-layered structure of paper (30).

In this case, the paper material and synthetic resin material can be layered together by melting and solidifying the synthetic resin material on the surface of the paper material, or by first preparing the paper material and synthetic resin material separately and then sticking them together with an adhesive.

[0014] Figure 3 is a plane view showing one example of a band of connected closures of an embodiment of the present invention.

In the band 36 of connected closures shown in Figure 3, closures formed of a composite layer having one layer of thick paper are attached together.

Closure holes for closing a bag or other object to be closed are provided roughly in the center of closures, 31, 31... of this embodiment in the plane view. An opening smaller than the closure hole and communicating with the closure hole is formed at one end of the closure. Each closure also has detachable connection parts 34, 34... on the side faces for connecting the closure to other adjacent closures in a line when they are connected in a band of connected closures. A band 36 of connected closures of this embodiment is formed with the aforementioned connection parts 34, 34 formed on the side faces of closures 31 connected to each other in a line. Notches 35, 35... are formed extending towards the inner layer on the surfaces of the connection parts of each closure.

[0015] An example of the band of connected closures of the present invention is given below. However, the present invention is not limited by this example.

Example 1

[0016] For the comparative example, nine pieces of grey-colored paperboard (MARICOAT made by Hokuetsu Paper Mills, Ltd.) were prepared as closure samples (single-layer samples).
Next, closure samples (composite layer) were prepared with the five-layer structure shown in Figure 2(c) and they had a laminated structure of PET/PE/grey-colored paperboard (paper)/PE/PET. The paper and PE were bonded by melting the polyethylene. The PE and PET (biaxial orientation) were laminated using an ether adhesive.
The polyethylene terephthalate layer was 12 μm thick and the polyethylene layer was 60 μm thick.

[0017] The aforementioned closure samples were each cut into strips 2 mm wide by 100 mm long, which were modified under the following conditions.

(1) Samples left to dry for 12 hours or more in a thermostatic oven at 50˚C (humidity 20%): storage under dry conditions
(2) Samples left for 12 hours or more at room temperature (humidity 55 to 65%): storage under normal humidity conditions
(3) Samples immersed in water and left for 12 hours in a container maintained at high humidity (humidity 85%) or more: storage under moist conditions

[0018] Sets of three samples for the respective types of samples (single-layer samples and composite layer samples) were each kept under each of the above three types of conditions, and removed. One sample from each set was selected, and bending stress was applied by folding once the sample at a 90˚ angle to one surface of the sample (hereunder, "single fold"). Another sample was then selected, and bending stress was applied by first folding the sample at a 90˚ angle to one surface and then folding it at a 90˚ angle to the other surface for a total of two folds (hereunder, "double fold"). Samples applied with no stress are referred to as "no fold".
Both ends of each sample were held with chucks so that the longitudinal direction of the strip-shaped sample is aligned up and down, and tensile tests were performed by moving the movable chuck upwards. The evaluation results are shown in Table 1 below.

[Measurement conditions]

[0019]

Measurement equipment: Tensile tester (Orientec Corp. TENSILON RTC-1210A)
Sample width: 2 mm
Chuck movement speed: 300 mm/min

[0020]

[Table 1]

		Storage conditions		
		Dry	Normal humidity	Moist
No fold	Single-layer samples	15.4	15.4	13.0
	Composite layer samples	30.5	27.1	23.9
Single fold	Single-layer samples	12.0	12.8	10.3
	Composite layer samples	25.6	25.9	22.4

(continued)

		Storage conditions		
		Dry	Normal humidity	Moist
Double fold	Single-layer samples	6.1	8.6	10.4
	Composite layer samples	23.4	24.2	21.2
(Unit: N)				

[0021] Table 2 below shows the evaluation results of Table 1 as percentages given the results for the "no fold" sample under each type of storage conditions as 100.

[Table 2]

		Dry	Normal humidity	Moist
No fold	Single-layer samples	100	100	100
	Composite layer samples	100	100	100
Single fold	Single-layer samples	78	83	79
	Composite layer samples	84	96	94
Double fold	Single-layer samples	40	56	80
	Composite layer samples	77	89	89
(Unit: %)				

[0022] Ordinarily, paper has the property of becoming hard and fragile when left under dry conditions. Under moist conditions, it becomes soft. That is, under dry conditions it becomes strong with respect to tension but weak with respect to bending. Under moist conditions, on the other hand, it becomes weak with respect to tension but resists crease formation when folded, with little change in breakability.
It can be seen from the evaluation results of Table 1 and Table 2 above that the samples left under the dry, normal humidity or moist conditions all undergo a decrease in tensile strength when subjected to bending stress. It is also shown that the decrease is greater with a double fold than with a single fold.
Looking at the "moist, double fold" samples for example, there was roughly 20% deterioration in the case of the paper single-layer sample, but less deterioration (about 11%) in the case of the composite layer sample. Looking at the "dry, double fold" samples, there was about 60% deterioration in the case of the single-layer sample, but only about 23% in the case of the composite layer samples, indicating good effects under dry conditions.
From this it can be seen that a composite layer closure sample is more resistant to bending stress than a paper single-layer sample due to the layering of a highly flexible synthetic resin. Because the synthetic resin is also resistant to the influences of moisture, moreover, a composite layer closure sample is also much stronger than a single-layer closure sample.

Example 2

[0023] The same grey-colored paperboard (MARICOAT made by Hokuetsu Paper Mills, Ltd.) used in Example 1 was prepared.
60 μm-thick polyethylene resin was then prepared.
A composite layer consisting of 12 μm polyethylene terephthalate resin bonded to 60 μm polyethylene resin was also prepared.
Using these three kinds of samples, the pulled distance and tensile strength of the test samples were measured using the tensile tester of Example 1.
Figure 4 is a graph showing the relationship between pulled distance and tensile strength of a single-layer sample (paper).
Figure 5 is a graph showing the relationship between pulled distance and tensile strength of polyethylene resin.
Figure 6 is a graph showing the relationship between pulled distance and tensile strength of a composite layer.
Figure 7 is a graph showing the relationship between pulled distance and tensile strength of a composite layer of paper and polyethylene synthetic resin.
Figure 8 is a graph showing the relationship between pulled distance and tensile strength of a composite layer of paper

and synthetic resin.

[0024] As shown in Figure 4, the single-layer sample exhibited maximum strength when pulled about 1 mm. It is thought that this was the point at which the sample tore.

As shown in Figures 5 and 6, a synthetic resin layer does not tear at about 1 mm in the same way as paper. Up to about 3 mm strength increases proportionally, after which the resin exhibits a stable strength value without tearing and then tears. The inclination angle of the curve and the displacement before tearing differ depending on the type of synthetic resin. Figure 7 shows results for 60 μm polyethylene resin laminated on both sides of paper, while Figure 8 shows results for a composite layer of 60 μm polyethylene resin and 12 μm polyethylene terephthalate resin laminated on both sides of paper. As shown in Figure 7, the resulting graph is roughly what would result from combining the graphs for the single-layer samples of Figures 4 and 5. The graph obtained in Figure 8 is roughly what would result from combining the graphs of Figures 4 and 6.

[0025] Thus, it is possible to adjust the strength by changing the type of synthetic resin. Moreover, while the connection parts of the single-layer samples break when pulled about 1 mm, laminating a synthetic resin allows for stable transportation because breakage does not occur even when the connection parts are pulled with strong pull force. The breaking strength of the connection parts can also be adjusted by adjusting the combination and thickness of the synthetic resin layers.

Example 3

[0026] Next, the amount of paper dust occurring when the paper is broken or cut was tested by visual observation. 350 μm-thick paper (basis weight 280 g/m^2) was prepared.

A composite layer was also prepared consisting of 60 μm-thick polyethylene resin (PE) attached to both sides of the aforementioned paper.

Each sample was cut into 30 mm width and 100 mm long strips, and a folding line was drawn across the width of each strip. Black sheets were prepared, and each strip was subjected several times to bending stress along the folding line atop the black sheet. Samples were torn along the fold line after five folds and after ten folds, and the amount of paper dust scattered on the black sheet was examined visually.

The results of observation are shown in Table 3. In the table, O indicates no fallen fibers (paper dust), Δ indicates that fibers (paper dust) of less than 1 mm fell, and × indicates that fibers (paper dust) of mm or more fell.

[0027]

[Table 3]

Times folded	Paper only	PE laminate on both sides
1	○	○
5	Δ	○
10	×	Δ

[0028] When bending stress is applied multiple times to the same site, the fibers at the folding site become loose. When this area is torn, paper dust is likely to occur.

As shown in Table 3 above, when the synthetic resin PE is laminated on both sides of paper, the fibers on the surface of the paper adhere to the polyethylene resin and are held by it even under repeated bending stress, resulting in very little paper dust.

Thus, it is possible by laminating synthetic resin on a layer formed from paper to prevent scattering of paper dust and suppress the problem of foreign matter contamination of the object to be closed.

Example 4

[0029] Two sheets (basis weight 600 g/m^2) of grey-colored paperboard (MARICOAT made by Hokuetsu Paper Mills, Ltd.) were prepared for each sample.

Closure samples were prepared with the layered structures shown in Figures 9(a) to (e) using this grey-colored paperboard. The closure samples used in this example were bands of connected closures comprising multiple closures connected by their connection parts.

Sample 1: grey-colored paperboard (41)/80μm PE (42)/grey-colored paperboard (41)

In the connection parts, the surface layers formed by paper on both sides are cut, leaving the closures attached by the synthetic resin layer (Figure 9(a)).

Sample 2: grey-colored paperboard (41)/40 μm PE (42)/12 μm PET (43)/40 μm PE (42)/ grey-colored paperboard (41)
In the connection parts, the surface layers formed by paper on both sides are cut, leaving the closures connected by the synthetic resin layers (Figure 9(b)).
Sample 3: grey-colored paperboard (41)/40 μm PE (42)/12 μm PET (43)/40 μm PE (42)/ grey-colored paperboard (41)
Notches are formed in the connection parts through about 2/3 of thickness of the surface of both surface layers formed from paper, leaving the closures connected by the synthetic resin layers and by thinned layer of paper (Figure 9(c)).
Sample 4: grey-colored paperboard (41)/40 μm PE (42)/12 μm PET (43)/40 μm PE (42)/ grey-colored paperboard (41)
In the connection parts, one of the surface layers formed of paper is cut, leaving the closures connected by a layer of synthetic resin and a single layer formed of paper (Figure 9(d)).
Sample 5: grey-colored paperboard (41)/40 μm PE (42)/12 μm PET (43)/40 μm PE (42)/ grey-colored paperboard (41)
No notches are formed in the connection parts (Figure 9(e)).

[0030] A connection strength test was performed using the bands of connected closures described above. Connection strength was measured in two directions, i.e., in the direction of feed and in the direction of across-the-width.
Connection strength in the direction of feed was measured as shown in Figure 10 by securing closures 51 and 51 connected by connection parts 52 with chucks 55 and 56 disposed above and below the closures, exerting perpendicular pull, and measuring the strength at the time that the connection parts of the adjacent closures were detached.
Connection strength in the across-the-width direction was measured as shown in Figure 11 by securing closures 51 and 51 connected by connection parts 52 and 52 with chucks 55 and 56 disposed above and below the closures, exerting perpendicular pull, and measuring the strength at the time when the connection parts of the adjacent closures were detached.
The results are shown in Table 4.

[0031]

[Table 4]

Sample No.	Tensile strength in direction of feed	Tensile strength in across-the-width direction
1	1.3	1.2
2	4.8	5.1
3	6.5	7.3
4	9.7	10.4
5	15.3	16.2
(Unit: N)		

[0032] As shown in Table 4 above, Sample No. 4 having notches formed on the surface of one side of the connection parts on the band of connected closures had less detachment strength in both the direction of feed and the across-the-width direction than Sample No. 5, which had no formed notches.
It can also be seen that Sample No. 3 having notches formed about 2/3 of the way towards the inner layer on both surfaces had less detachment strength than Sample No. 4. Samples No. 1 and No. 2 whose paper layers are severed in the connection parts had even less detachment strength, and Sample No. 1 in particular had particularly low detachment strength in the across-the-width direction.
When an actual package product is closed with a closure, the idea is that a band of connected closures is reeled out along guard rail 58 in the direction of the arrow as shown in Figure 12, and open ends 55 of package products 54 which are being transported in the direction of the arrow by conveyor belt 52 or the like are inserted into the openings communicating with the closure holes at the center of closures 51 as hammer 57 is moved from the side of the closure in the direction of the arrow to hit the closure and detach it from the band.
In such a case, it is desirable that not only the tensile strength in the direction of feed but also the tensile strength in the across-the-width direction be somewhat low.

Example 5

[0033] One example of closures according to the present invention was manufactured and subjected to impact-resistance testing (drop test).
The closures prepared and used in this example were single-layer paper samples 22 mm long and 21 mm wide, with a basis weight of 280 g/m^2 (Sample 6), 440 g/m^2 (Sample 7), 560 g/m^2 (Sample 8), 8'40 g/m^2 (Sample 9) and 1100 g/m^2 (Sample 10), and a commercial plastic closure (polystyrene, 800 μm thick, Sample 11) was also prepared.

The impact resistance test was performed as follows.
First, a one-loaf bread bag was inflated with air, and the opening was closed with the closure.
Next, the closed bread bag was placed on a smooth floor. A square weight was then dropped towards the top of the bag from the specific heights shown in Table 5 below, in such a way that the bottom face of the weight remained level. The degree of damage to the closure from the shock of the falling weight was observed visually. The results are shown in Table 5.
In Table 5, O means no damage to the closure, and × means the closure tore or was detached from the opening of the bag.
[0034]

[Table 5]

Sample	Drop height (mm)					
	30	50	100	300	600	900
6	×	-	-	-	-	-
7	○	○	×	-	-	-
8	○	○	○	○	×	-
9	○	○	○	○	○	×
10	○	○	○	○	○	○
11	○	○	○	○	×	-

As shown above, in the case of Sample 6 with a basis weight of 280 g/m^2, the closure was too soft and the binding strength insufficient.

Example 6

[0035] A bending strength test was performed using the closures prepared in Example 5.
The bending strength test was performed by the method shown in Figure 13 using a tensile tester (TENSILON RTC-1210A, made by Orientec Co.).
Using a closure shown in Figure 13(a), two strings 63 and 64 were tied to either side of opening 62 of closure 61 as shown in Figure 13(b), and secured to chucks 65 and 66 located above and below the closure.
In this state chucks 65 and 66 were moved up and down, respectively as shown in Figure 13(c), and the strength was measured when the opening reached 10 mm. The results are shown in Table 6.
[0036]

[Table 6]

Sample No.	Strength
6	0.1
7	0.7
8	0.75
9	2.0
10	2.4
11	1.25
(Unit: N)	

It appears from looking at the results of Table 6 that Sample 6 with a basis weight of 280 g/m^2 could detach because it would not be able to withstand the rigidity of the bag. On the other hand, Sample 10 with a basis weight over 1000 g/m^2 was rigid itself and thus the closure was difficult to clip around the opening of a bag by fingers.
It was confirmed from the results of Table 5 and Table 6 that paper with a basis weight of 440 g/m^2 to 840 g/m^2 can be preferably used.

Example 7

[0037] Closures were prepared using food packaging paper with relatively long fibers (100% virgin pulp, no recycled paper) and a basis weight of 350 g/m^2, with connection parts on the sides, to prepare a band of connected closures in which the adjacent connection parts were connected to each other in a line (Sample 12).
A band of connected closures was also prepared using the grey-colored paperboard (MARICOAT made by Hokuetsu Paper Mills, Ltd.) with relatively short fibers and a basis weight of 600 g/m^2. Each closure was provided with connection parts on the side faces that were connected in a line to adjacent connection parts to prepare a band of connected closures (Sample 13).
A connection strength test was performed using these bands of connected closures.
As shown in Figure 11, closures 51 and 51 connected by connection parts 52 and 52 were secured with chucks 55 and 56 arranged above and below the closures, perpendicular pull was exerted, and the strength was measured at the time that the connection parts of the closures were detached.
The results are shown in Table 7.

[0038]

[Table 7]

Sample No.	Measurement value	600 g/m^2 conversion
12	8.0	13.7
13	9.2	9.2
(Unit: N)		

As shown in Table 7 above, Sample 13 with relatively short fibers had less connection strength than Sample 12 with relatively long fibers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039]

Figure 1 is a plane view showing one example of a closure of an embodiment of the present invention.
Figure 2 is a cross-section along an arrow II-II showing a closure 1 of the embodiment shown in Figure 1.
Figure 3 is a plane view showing part of a band of connected closures of another embodiment of the present invention.
Figure 4 is a graph showing the relationship between pulled distance and tensile strength for a single-layer sample (paper).
Figure 5 is a graph showing the relationship between pulled distance and tensile strength for polyethylene.
Figure 6 is a graph showing the relationship between pulled distance and tensile strength for a composite layer.
Figure 7 is a graph showing the relationship between pulled distance and tensile strength for a composite layer of paper and polyethylene synthetic resin.
Figure 8 is a graph showing the relationship between pulled distance and tensile strength for a composite layer of paper and synthetic resin.
Figure 9 shows cross-sections of the closures of Example 4, which consist of layers of paper and synthetic resin.
Figure 10 is an outline explaining a connection strength test in the direction of feed performed using the band of connected closures of Example 4.
Figure 11 is an outline explaining a tensile strength test in the across-the-width direction using the bands of connected closures according to Examples 4 and 7.
Figure 12 is an outline showing one example of a method for closing an object to be closed using a closure according to an embodiment of the present invention.
Figure 13 is an outline explaining the bending strength test performed in Example 6.

EXPLANATION OF REFERENCE NUMERALS

[0040]

1, 31, 51, 61	Closure
2	Closure hole

3, 62	Opening
4, 34, 52	Connection part
11, 13, 15, 19, 24, 27, 30, 41	Paper layer
12, 14, 16, 17, 18, 20, 21, 22, 23, 25, 26, 28, 29, 42, 43	Synthetic resin layer
35	Notch
36	Band of connected closures

Claims

1. A closure having a closing function and reclosability, which is formed of a single paper layer or a composite layer having at least a layer formed of paper, and which has a closure hole, provided substantially in a center part, for closing an object to be closed, and which is further provided with, at one end, an opening that is smaller than the closure hole, the opening communicating with the closure hole.

2. The closure having a closing function and reclosability according to claim 1, comprising, on side faces of the closure, detachable connection parts that are connected to other closures adjacent thereto that are in a line with the closure, when the closure and the other closures are formed as a band of connected closures.

3. The closure according to claim 1 or 2, wherein the closure is formed of a composite layer having at least a layer formed of paper, and wherein at least one of layer or layers other than the paper layer is formed from synthetic resin and/or biodegradable resin.

4. The closure according to claim 3, wherein the layer formed from the synthetic resin and/or biodegradable resin includes an oriented film.

5. The closure according to Claim 3 or 4, wherein the closure is formed of a composite layer comprising layers made of paper that are laminated on both surfaces of the layer of synthetic resin and/or biodegradable resin.

6. The closure according to claim 3 or 4, wherein the closure is formed of a composite layer comprising the layers of synthetic resin and/or biodegradable resin laminated on both surfaces of the layer of paper.

7. The closure according to any one of claims 3 to 6, wherein the layer of synthetic resin is formed from any one of olefin resin, polyethylene terephthalate (PET), polystyrene (PS), acrylonitrile (AN) and polyvinyl alcohol (PVA).

8. The closure according to any one of claims 1 to 7, wherein one or more notches are formed in the connection parts of the closure from one or both surfaces thereof towards an inner layer.

9. The closure according to any one of claims 3 to 8, wherein only the layer made of paper at the connection parts of the closure is severed.

10. The closure according to any one of claims 1 to 9, wherein the weight per unit area of the paper is 400 to 1000 g/m^2.

11. The closure according to any one of claims 1 to 9, wherein the average length of fibers making up the paper is 1.0 mm to 4.0 mm.

12. The closure according to any one of claims 1 to 11, wherein ink or a coating material is printed or coated on the surface of the closure.

13. A band of connected closures formed by connecting the closures according to any one of claims 2 to 12 in a line by means of the adjacent connection parts of the closures.

14. A package product wherein the object to be closed is closed using the closure according to any one of claims 1 to 12.

FIG. 1

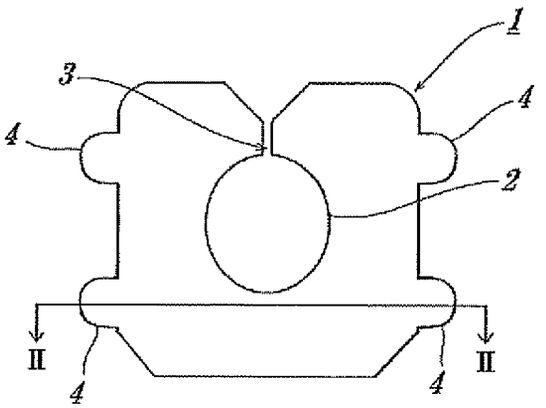


FIG. 2

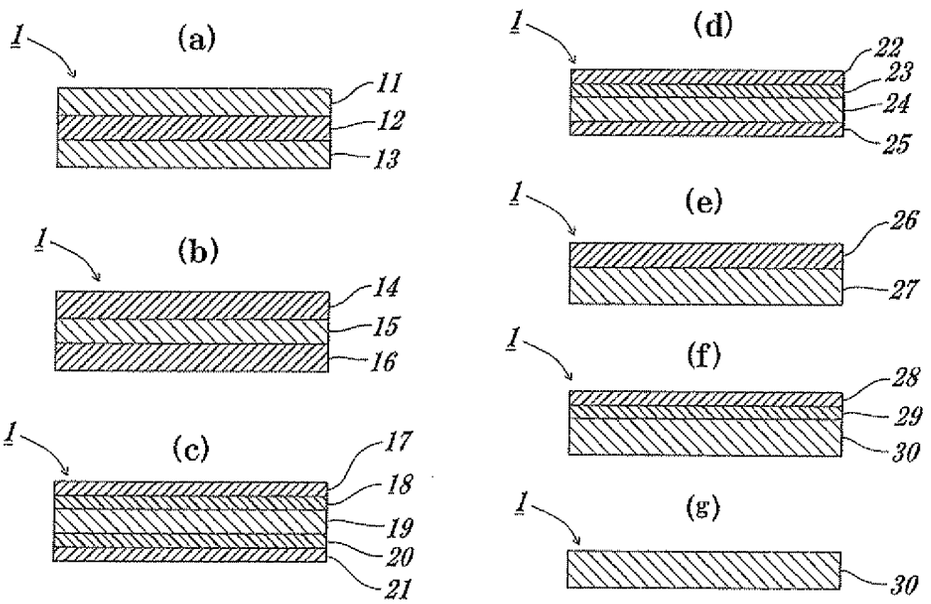


FIG. 3

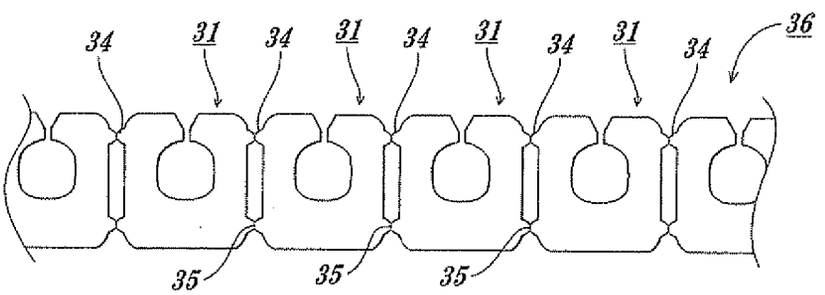


FIG. 4

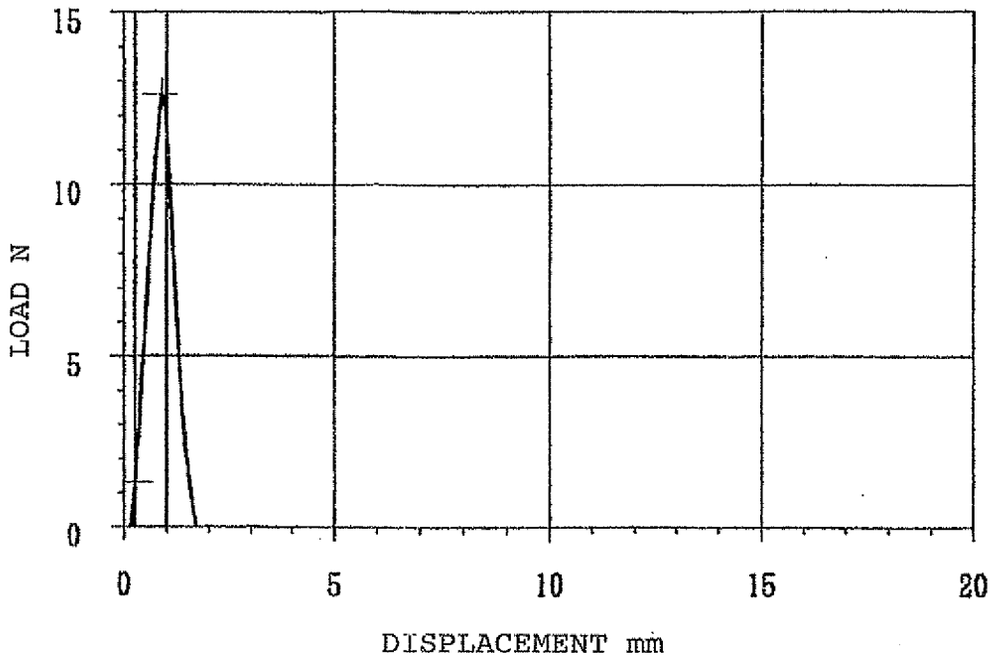

15
10
5
0
LOAD N
0
5
10
15
20
DISPLACEMENT mm

FIG. 5

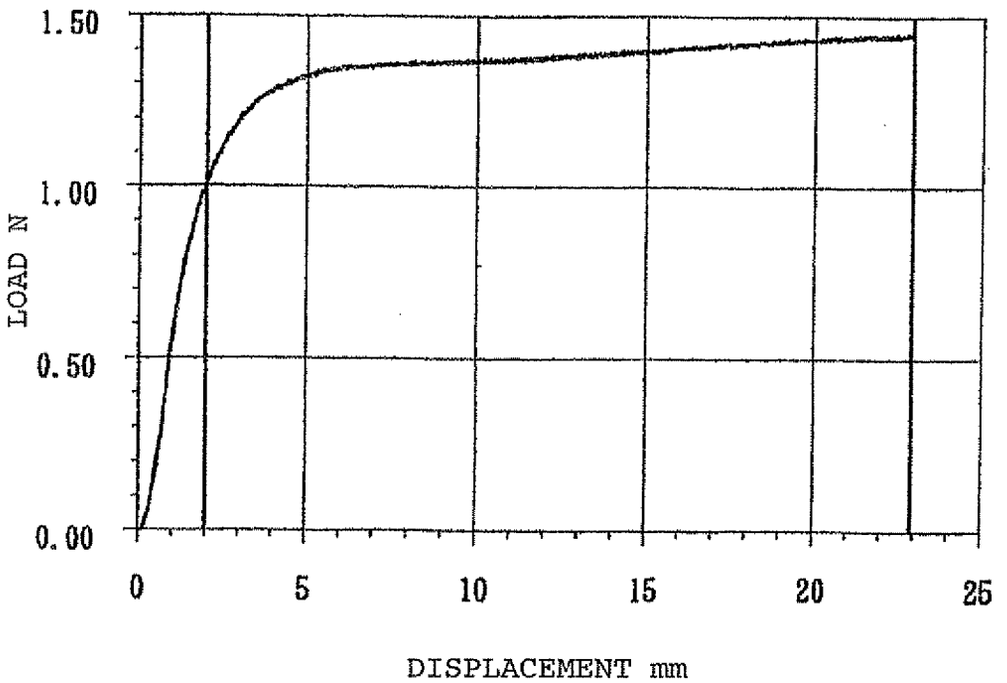

1.50
1.00
0.50
0.00
LOAD N
0
5
10
15
20
25
DISPLACEMENT mm

FIG. 6

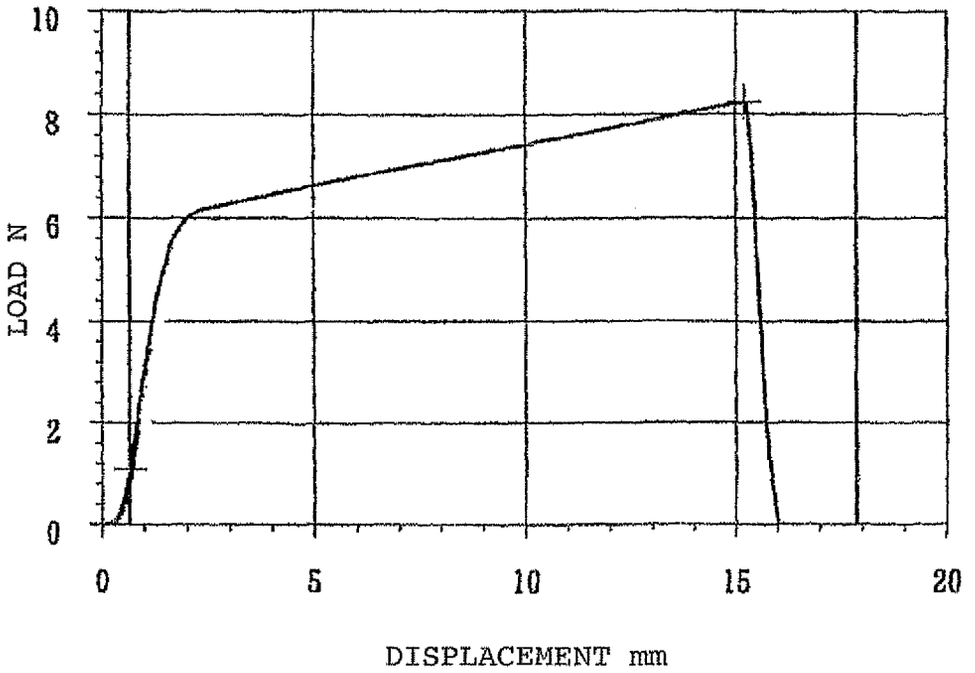

10
8
6
4
2
0
LOAD N
0
5
10
15
20
DISPLACEMENT mm

FIG. 7

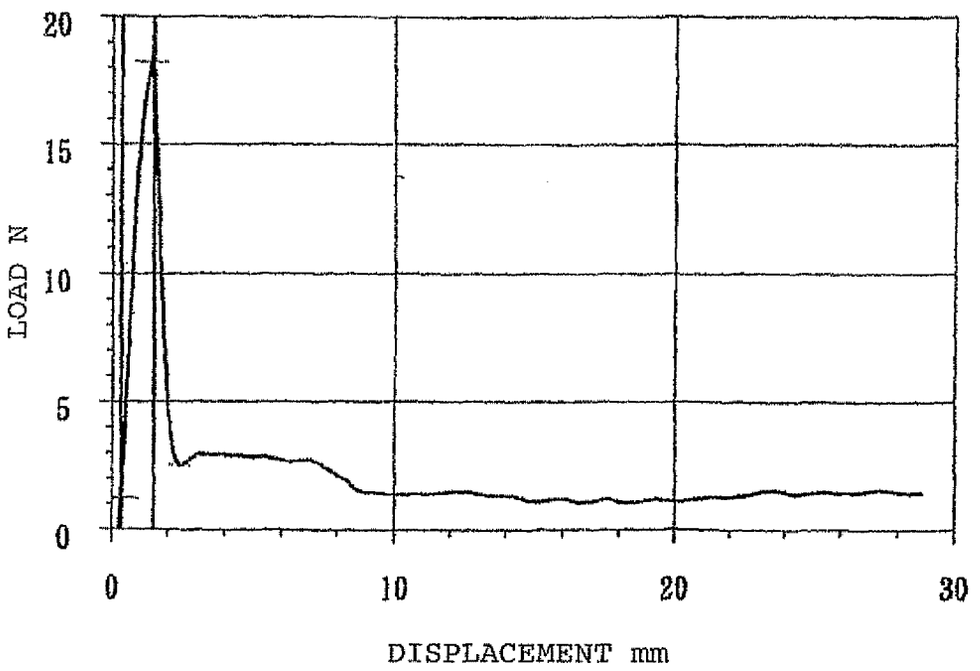

20
15
10
5
0
LOAD N
0
10
20
30
DISPLACEMENT mm

FIG. 8

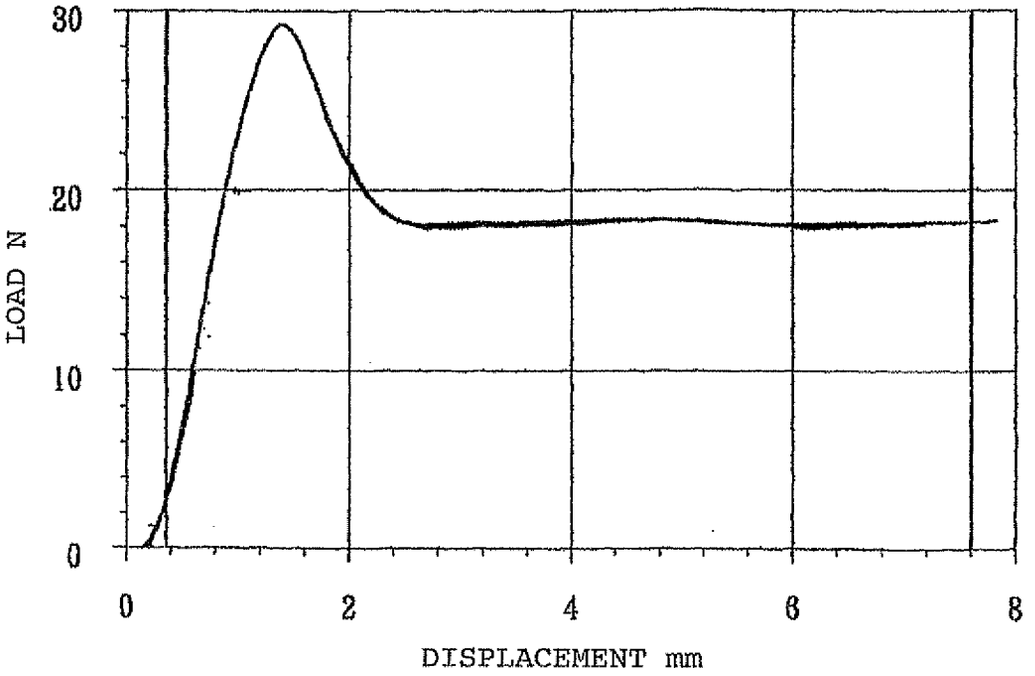

30
20
10
0
LOAD N
0
2
4
6
8
DISPLACEMENT mm

FIG. 9

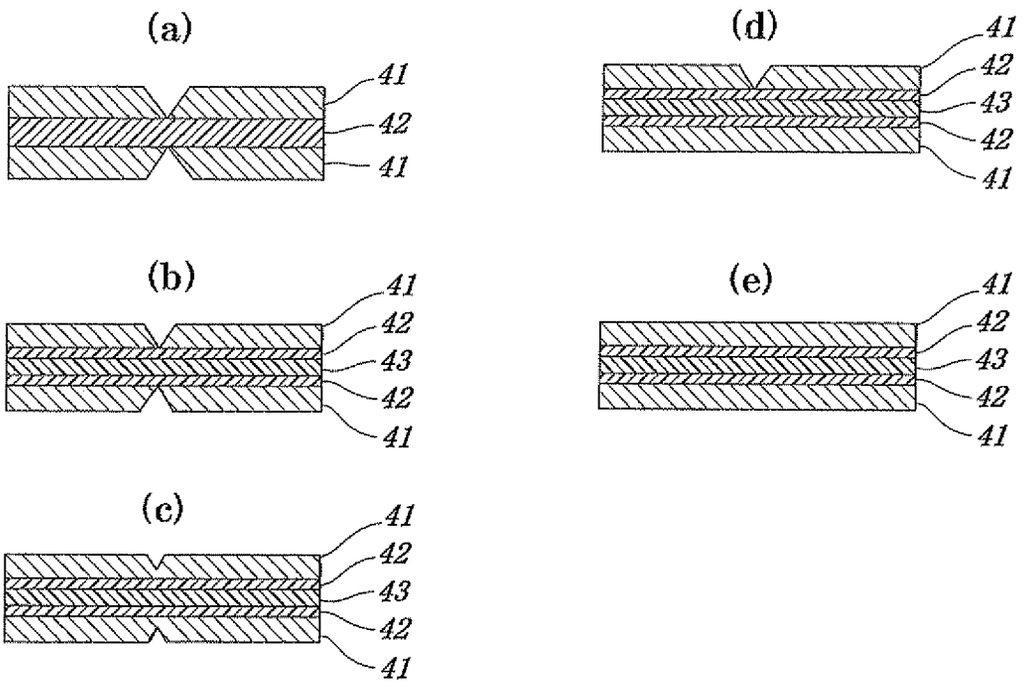

(a)
41
42
41
(b)
41
42
43
42
41
(c)
41
42
43
42
41
(d)
41
42
43
42
41
(e)
41
42
43
42
41

FIG. 10

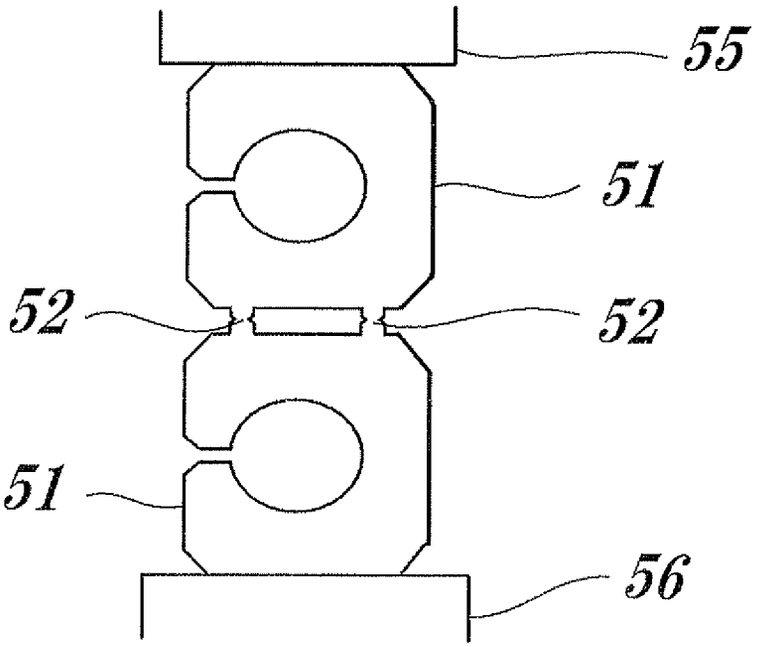


FIG. 11

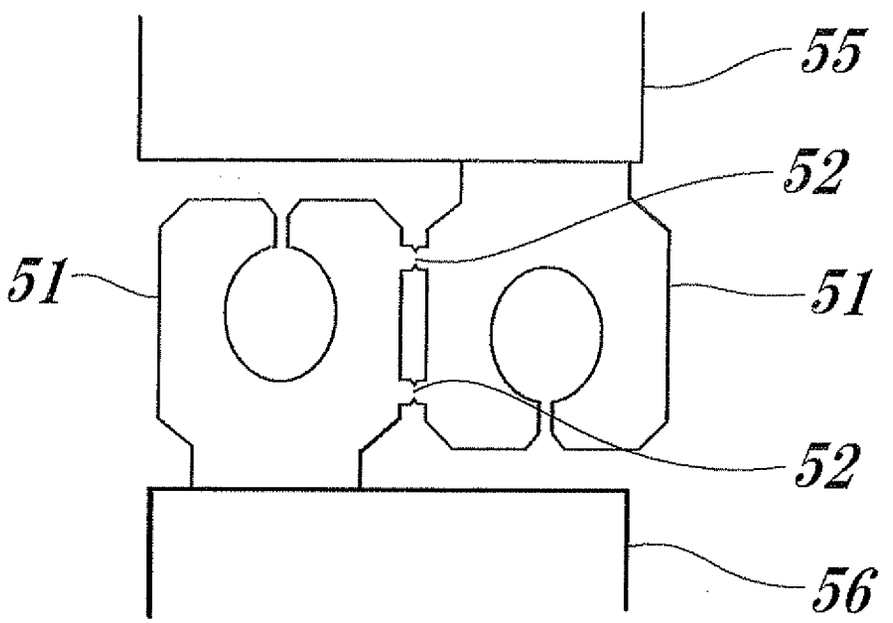


FIG. 12

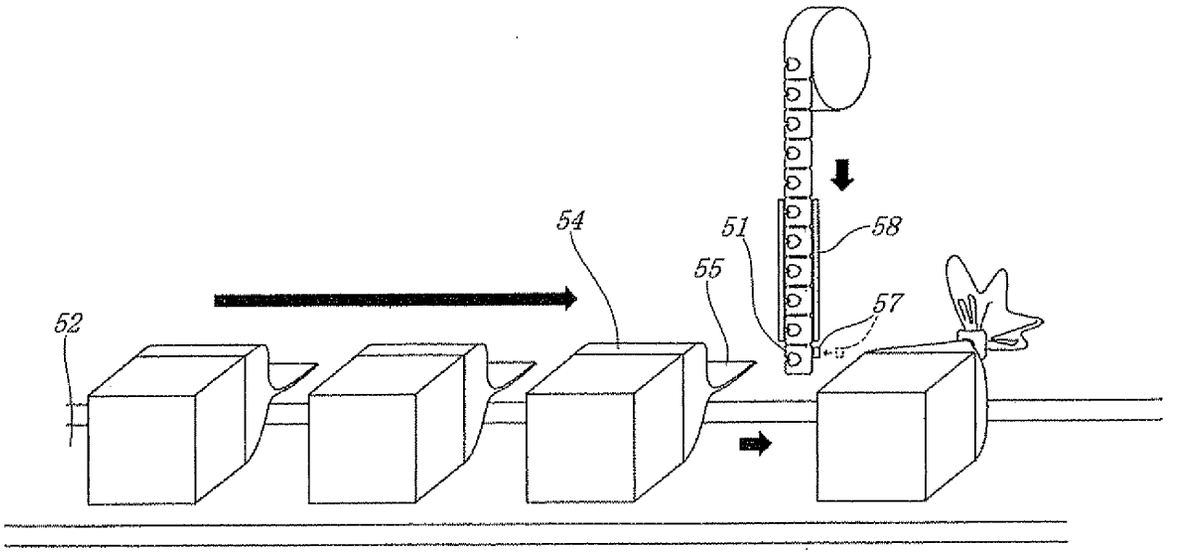
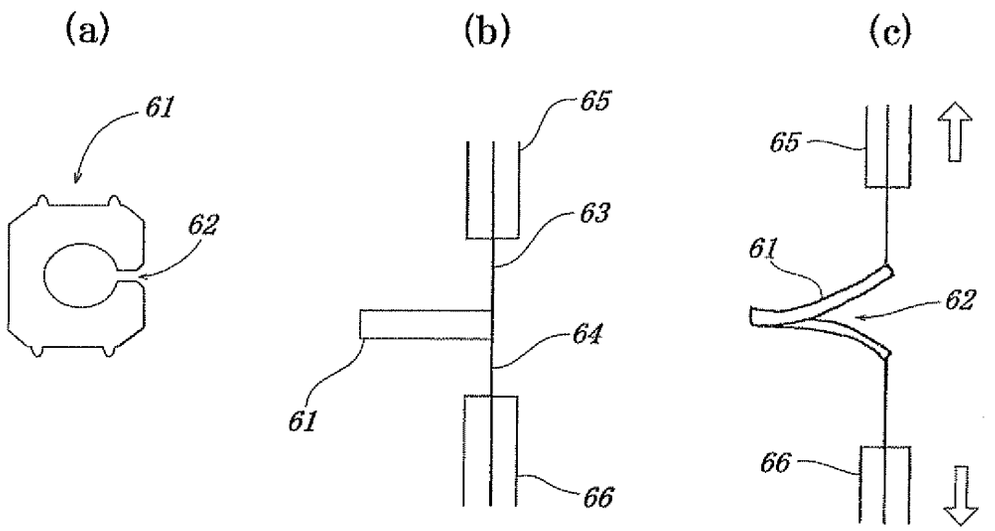


FIG. 13



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/058582

A. CLASSIFICATION OF SUBJECT MATTER
B65D33/30(2006.01)i, *B65D77/18*(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D33/30, B65D77/18

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1473296 A (BRITT J; WILSON E), 11 May, 1977 (11.05.77), Full text; all drawings (Family: none)	1-8,10-14
A	JP 2001-287767 A (Dainippon Printing Co., Ltd.), 16 October, 2001 (16.10.01), Par. Nos. [0018], [0023]; Fig. 8 (Family: none)	9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 July, 2008 (31.07.08)	12 August, 2008 (12.08.08)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/058582

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The matter common to the inventions of claims 1 - 14 is a binder having a binding function and sealability, characterized in that it is made of composite layers having a single paper layer or at least a layer of paper and has a binding hole generally at its central portion for binding a binding object, and in that a narrower opening than the binding hole for communicating with said binding hole is formed at one end. However, the search has revealed that the common matter is not novel, since it was disclosed in document: GB 1473296 A (BRITTJ; WILSONE), 11 May, 1977 (11.05.77), the whole specification and all the drawings.
(continued to extra sheet)

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

the

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2007)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/058582

Continuation of Box No.III of continuation of first sheet(2)

As a result, the aforementioned binder does not have the special technical features within the meaning of PCT Rule 13.2, second sentence, since the common matter does not explicitly specify any contribution over the prior art.
Hence, these inventions cannot be considered so relative as to form a single general inventive concept, since they are not so technically related as to involve one or two or more of the same or corresponding special technical features.

Form PCT/ISA/210 (extra sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001080654 A **[0004]**
- JP 2000179510 A **[0004]**
- JP 2001002092 A **[0004]**
- JP H1059334 B **[0004]**
- JP S5796954 B **[0004]**