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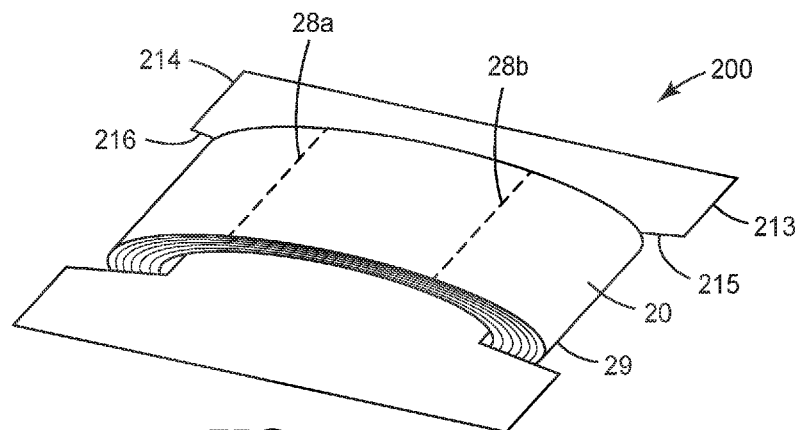


FIG. 3

(57) Abstract: Flat wound tape article with a flat core and tape wound around the core. The article is configured so that it can help protect the edges of the tape from adhering to dirt, dust, lint, etc. while maintaining a convenient shape for use.



FLAT WOUND TAPE ARTICLE AND METHOD

BACKGROUND

5 Tapes are most often manufactured to be wound around a circular core. This is a common configuration that most users are accustomed to.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a tape article with a tape wound around an exemplary flat core.

Figure 2 is an exemplary flat core that is different from the flat core depicted in Figure 1.

10 Figure 3 is a tape article with a tape wound around the flat core that is depicted in Figure 2.

Figure 4 is a side view of an exemplary section of tape.

Figure 5 is a side view of another exemplary section of tape.

Figure 6 is a side view of yet another exemplary section of tape.

15 Figures 7A-7E are schematics of a tape article featuring a tape wound around an exemplary flat core for illustrating how bow and twist are determined in this disclosure.

DETAILED DESCRIPTION

20 Throughout this disclosure, singular forms such as “a,” “an,” and “the” are often used for convenience; however, the singular forms are meant to include the plural unless the singular alone is explicitly specified or is clearly indicated by the context. When the singular alone is called for, the term “one and only one” is typically used.

Some terms in this disclosure are defined below. Other terms will be familiar to the person of skill in the art and should be afforded the meaning that a person of ordinary skill in the art would have ascribed to them.

25 The terms “common,” “typical,” and “usual,” as well as “commonly,” “typically,” and “usually” are used herein to refer to features that are often employed in the invention and, unless specifically used with reference to the prior art, are not intended to mean that the features are present in the prior art, much less that those features are common, usual, or typical in the prior art.

30 The inventors of this Application recognized several problems with tape articles. Tape articles can be inconvenient to keep in a pocket or handbag. One problem is that tape articles can be awkwardly shaped for keeping in a pocket, toolbox, work bag, handbag, etc. For example, tape that is wound in a circle, as most tape articles are, is not in a convenient shape to keep in a pocket, toolbox, bag, etc. In addition, regardless of the core shape, the edge of adhesive tape rolls can expose the adhesive on the tape edge to the surrounding environment. While this may not be

problematic when the tape article is stored in a box or kept in a dispenser, it is a problem when the tape article is kept outside of a dispenser such as in a toolbox, in a pocket, or on a shelf. This is also a problem when the tape article is in use, for example, when the tape article is used outdoors or in a work area where dirt, dust, lint, etc. are present. In such cases, dirt, lint, and the like can
5 adhere to the edges of the tape article, thereby making the tape article less attractive to the user and inhibiting the functionality of the tape.

While it may be possible to make a tape article by rolling a tape around a deformable round core and then deforming the article by flattening it the resulting article is not aesthetically pleasing and may have defects in the tape, so that approach is deemed unacceptable for the purposes of this
10 disclosure. Also, when a flat tape article is made by this method, the tape article can be easily damaged by physical impact, such as by dropping on a hard surface like concrete, cement, asphalt, rock, or by inadvertently being struck with a tool such as a hammer. Thus, another problem is that the tape of tape articles can be easily damaged, particularly by physical impacts to the edge of the tape article, causing the tape lose some of its functionality or aesthetically attractive properties.

15 It should be noted that loss of aesthetically attractive properties is of technical import because users of tape articles are likely to associate loss of aesthetic attractiveness with a loss of functionality of the tape even if the tape in fact retains its functionality.

Briefly, a solution to one or more of these problems, as well as other problems, lies in a tape article comprising a flat or substantially flat core comprising a first major surface and opposing
20 second major surface, as well as a first core edge and opposing second core edge and a third core edge and opposing fourth core edge. The core has a core width defined by the shortest distance from the first core edge to the second core edge.

A tape roll is around the flat core. The tape roll comprises a tape in a wound disposition in successive layers of tape around the flat core from the third edge to the fourth edge. With the
25 exception of the first layer of tape in the tape roll, which is disposed directly against the flat core, each layer of tape in the tape roll is typically disposed directly above the layer below it, with a small allowance for manufacturing variances, such that the width of the tape roll is identical to the width of the tape itself.

Thus, the disclosure provides a tape article with a flat core having tape wound around the flat
30 core. The resulting article tends to be slim or near flat, and thus takes up less space than a traditional circular tape article and thus is more convenient to store in a pocket, toolbox, shelf, etc. The flat core is configured so that part of the flat core projects beyond the edges of the tape. This configuration of the flat core protects the tape edges from dust, dirt, lint, etc. While any type of tape can be used in the tape article, the most common tapes are hand-tearable tapes. Examples

include masking tapes, such as those with a backing material that is made of paper, which can optionally be coated, laminated, or saturated with a polymer, duct tape, which may have a backing layer made of yarn, fiber, or narrow plastic strip(s) laminated with a polymer, or hand-tearable transparent tape having a backing material that is bi-axially oriented polypropylene laminated with mono-axially oriented polypropylene. It is possible to use other types of tapes, such as those with a perforated backing.

The tape itself has a first side facing the flat core and an opposing second side. A first adhesive coating is typically present on the first side. The tape also has as a first tape edge and opposing second tape edge, wherein the shortest distance from the first tape edge to the second tape edge defines the tape width.

A tape roll has a tape roll width defined by the shortest distance between the first tape edge and the second tape edge. The core width is greater than the tape roll width, such that the first core edge extends beyond the first tape edge and the second core edge extends beyond the second tape edge. By this disposition, the first and second core edges act as a spacer to physically distance the first and second tape edges from dirt, lint, and the like, that might otherwise undesirably adhere to the first or second tape edges.

The flat core of the tape article is flat, as opposed to being circular, triangular, or some other shape. Typically, the flat core is manufactured of plastic, metal, paper, or the like. In principle any material can be used so long as it is sufficiently rigid so as not to appreciably bow during the winding process or under normal use. Rigidity can be assessed by the JIS K7171 test. Briefly, JIS K7171 is a three-point bending test that provides a strain stress curve. Most of the strain stress curve is linear, but the curve deviates from linearity and becomes parallel to the strain axis when the substrate being tested, here the flat core is about to break and eventually does break. The bend strength can be determined from this curve, as can the slope of the linear portion of the curve which can be likened to a modulus and has the units of N/mm^2 . Typical flat cores that are suitable for use in the article and methods described herein have a bend strength of no less than 0.4 N/mm and a strain stress curve comprising a linear portion with a slope of 0.04 N/mm^2 or greater. In some particular cases, the bend strength can be 0.04 N/mm^2 or greater, 0.45 N/mm^2 or greater or even 0.5 N/mm^2 or greater. In particular cases, the bend strength can be 40 N/mm^2 or less, 35 N/mm^2 or less, 30 N/mm^2 or less, or even 25 N/mm^2 or less.

In some particular cases, the linear portion of the stress strain curve can be 0.04 or greater, 0.05 or greater, 0.06 or greater, 0.07 or greater, 0.08 or greater, or even 0.09 N/mm^2 or greater. In particular cases, the linear portion of the stress strain curve can be 40 N/mm^2 or less, 35 N/mm^2 or less, 30 N/mm^2 or less, or even 25 N/mm^2 or less.

In all cases, the values of the bend strength and linear portion of the stress strain curve are measured according to JIS K7171. In many cases, a flat core having lower values for either the bend strength or the slope of the linear portion of the stress strain curve will not be sufficiently rigid to stay flat during the manufacturing process or in use for example in the pocket of a user.

5 The flat core is in most cases substantially unbowed. The bow of the flat core is measured according to the method described in the Examples section. When measured according to the method described in the Examples section, the bow is typically no more than 5%, optionally no more than 4.2%, optionally no more than 4%, optionally no more than 3%, optionally no more than 2%, or optionally no more than 1%.

10 The flat core is in most cases not substantially twisted. Twist in this disclosure is measured according to the method disclosed in the Examples section. When measured according to the method disclosed in the Examples section, the flat core typically has a percent twist that is no more than 5%, optionally no more than 4.2%, optionally no more than 4%, optionally no more than 3%, optionally no more than 2%, or optionally no more than 1%.

15 The tape used in the article can in principle be any tape. Most often, the tape will have a backing material and an adhesive on the first side, wherein the first side is the side facing the flat core. However, it is also possible to use tapes that have a backing material and no adhesive.

Any backing material suitable for a tape can be used. Typical backing materials that can be used are made of paper, plastic, knits, fabrics, non-wovens, or composites of two or more of the
20 foregoing. For example, fibers or yarns that are laminated with a polymer can be used as a backing material to increase the strength of the tape compared to fibers or yarns alone. One particular backing materials is bi-axially oriented polypropylene. Another particular backing material is polymer laminated paper. Another particular backing material is fiber yarns laminated with a polymer. Another particular backing material is mono-axially oriented polypropylene, and
25 more particularly mono-axially oriented polypropylene laminated with bi-axially oriented polypropylene. The backing material can be transparent or translucent, and particularly transparent, to the human eye.

The backing material is often selected or configured to be tear-by-hand, meaning that a piece of tape can be torn from the tape article without the need for a cutting implement such as a knife.
30 For example, when the backing material is mono-axially oriented polypropylene laminated with bi-axially oriented polypropylene the tape can be easily torn by hand in a substantially straight line. It is also possible to incorporate perforations into any backing material to impart tear by hand properties.

When used, the adhesive can in principle be any adhesive suitable for use on a tape. Exemplary adhesives include silicone adhesive, rubber adhesives, and acrylic adhesives. The adhesive may contain a tackifier, but this is not required in all cases because many adhesives are self-tacky. Pressure sensitive adhesives are most commonly employed.

5 When an acrylic adhesive is employed, it is typically a copolymer of two or more of (meth)acrylate esters. Optionally, the copolymer can include (meth)acrylic acid. Also optionally, the copolymer can include one or more other vinyl monomers (in addition to (meth)acrylic acid) such as styrene, n-vinyl pyrrolidone, vinyl acetate.

10 When a rubber-based adhesive is employed, it typically includes a rubber component, one or more tackifiers, and plasticizing oil. The rubber component may be natural rubber or synthetic rubber such as styrene/butadiene rubber, block copolymer of styrene and butadiene, or copolymer or block copolymer of styrene and isoprene. Typical tackifiers include wood rosin and its derivatives, terpene resins, and petroleum based resins.

15 Examples of tape without adhesive that can be employed include plumber's tape, tape made of polytetrafluoroethylene, bandages without adhesives (such as those sold under the trade designation ACE by 3M Company of St. Paul, MN, USA), athletic wraps, poly(tetrafluoroethylene) tape, and even gauze bandage. Examples of tape with adhesive that can be employed include those sold under the Scotch™ Brand by 3M Company, such as Scotch™ brand packaging tape, Scotch™ brand Magic Tape, masking tape, painter's tape, transparent tape, 20 duct tape, carton sealing tape, box sealing tape, electrical tape, and the like.

In most cases the tape used in the context of this disclosure has a generally flat profile; string, thread, yarn, and similar items with a round profile are generally not considered tapes by the artisan and the tape in this disclosure typically does not have a round profile.

25 In some cases, the tape can have a second adhesive the second side, such as in so-called "two-sided tape." In such cases, there can be a liner on the second side covering the second adhesive.

30 In many cases when the first side is coated with adhesive and second side is not coated with adhesive, the second side is coated with a low adhesive backsize (sometimes known as an LAB). Any low adhesive backsize that is suitable for use with the adhesive can be employed. Most commonly, when a low adhesive backsize is used, it is a silicone-based low adhesive backsize. Silicone-based low adhesive backsizes are typically quiet when unwound, so employing silicone-based low adhesive backsizes can provide the advantage that the user can use the tape article in a variety of environments including those where making excessive noise could be problematic.

The tape article can be made by winding the tape around the core. A variety of methods suitable for winding tape around cores are known to the artisan. Typically, a pre-slit roll of tape is provided and attached to an unwinder. A flat core is then attached to a winder so that the core can be rotated. An end of the roll of tape is fixed to the flat core and then the flat core is rotated to unwind the tape from the pre-slit roll and wind the tape around the flat core.

It is possible to have indicia on the flat core. In particular, the indicia can be present on one or both portions of the flat core that extends beyond the tape edges. When present, the indicia may be printed, embossed, recessed, or debossed. One advantageous type of indicia that is particularly advantageous is a ruler, or measurement scale. The ruler can be used both to measure the distance of objects, for example objects to which the tape might be adhered, and also to measure the length of tape to be torn from the tape roll. Other types of indicia that may be present include indicia representing the type of tape on the article, information about the use of the tape, reminders regarding the properties of the tape, and the like.

Turning to the figures, Figure 1 depicts article **100**, which includes flat core **10** having first core edge **11**, second core edge **12**, third core edge **13**, and fourth core edge **14**. Tape **20** is wound around the flat core **10** in direction **W** from the third core edge **13** to fourth core edge **14**. Tape **20** has first side **21** which faces the core **10** and opposing second side **22**, as well as first tape edge **23** and opposing second tape edge **24**. Tape roll has a roll width **RW** that is the shortest distance across the tape **20** from first tape edge **23** to second tape edge **24**. The core width **CW** is the shortest distance across core **10** from first core edge **11** to second core edge **12**. Core width **CW** is larger than roll width **RW**, and tape roll **30** is disposed on the core **10** such that first core edge **11** extends beyond first tape edge **23** and second core edge **12** extends beyond second tape edge **24**.

Figure 2 depicts flat core **200** having first core edge **211** second core edge **212**, third core edge **213**, and fourth core edge **214**. Third core edge **213** has notch **215** and fourth core edge **214** has notch **216**. It should be noted that while notches **215**, **216** provide some extra protection to tape **20**, they are not required in all cases because a flat-wound tape article according to the invention can be achieved even without the notches because most of the edge of the tape that might adhere to dirt, dust, and the like is protected by the core even without the notches. Also, adding the notches may increase the cost of the tape article, so when cost is very important it may be desirable to omit them. Embodiments that include the notches, however, are advantageous for most applications.

While the flat core **10** can be any suitable dimension, typical dimensions are about 45-300 mm long and 12-210 mm wide. The notches typically have a depth of 0.1 to 50 mm and a width, depending on the width of the overall core, of 10-298 mm. In one particular case, the flat core is

120 mm long and 60 mm wide, with two notches each having a width of 51 mm and a depth of 2.5 mm.

Figure 3 depicts tape **20** wound around flat core **200**. Tape **20** is wound within notches **215**, **216** in third and fourth core edges **213**, **214** such that the notches **215**, **216** are deeper than the distance between the outermost layer **29** of tape **20** and the core **200**. This allows portions of third and fourth core edges **213**, **214** to extend beyond the outermost layer **29** of tape **20**. In this figure tape **20** has perforations **28a**, **28b** which can facilitate tearing a desired length of tape **20** from the article. Perforations are not required, and in the case where tapes that can be torn by hand without perforations are used then they are neither necessary nor desirable.

While in principle any length of tape **20** can be wound around flat core **200**, typically the tape is long enough so that the thickness of the wound tape is 1.5 mm to 100 mm, such as 2 mm to 60 mm. The precise length will depend on the intended end use of the tape article, the type and thickness of the tape, and the dimensions of the flat core.

Figure 4 depicts a section of tape **20a** having first side **21**, second side **22**, and adhesive **21a** coated on the first side **21**.

Figure 5 depicts a section of tape **20b** having first side **21**, second side **22**, and adhesive **21a** coated on the first side **21** and a low adhesion backsize **22a** on second side **22**.

Figure 6 depicts a section of tape **20c** having first side **21**, second side **22**, and adhesive **21a** coated on the first side **21** and a second adhesive **22b** is coated on second side **22**. Liner **22c** covers second adhesive **22b** in this figure, but second adhesive **22b** can be present without liner **22c** in some cases.

Figure 7 depicts tape article **1700** featuring tape **70** wound around flat core **700**. Points **71a**, **71b**, **71c**, and **71d** are the locations where an edge of tape **70** intersects with flat core **700**.

Imaginary line **L1** connects points **71a** and **71d**, and imaginary line **L2** connects points **71b** and **71c**. Imaginary lines **L1** and **L2** intersect at point **72** on the surface of tape article **1700**.

Examples

Rigidity Tests

All rigidity testing was performed according to the JIS K7171 test method, a 3-point bending test with 25 mm width, 100 mm length and 80 mm distance between the fulcrums. All bend strength and slope of strain stress curves in this disclosure were determined, or are to be determined, using this method.

Determining Bow and Twist

All bow and twist percentages referred to in this disclosure were determined, or are to be determined according to the method described below. Figures 7A-7E help illustrate how bow and twist are determined. Generally, Figure 7A depicts tape article **1700** featuring tape **70** wound around flat core **700**. Points **71a**, **71b**, **71c**, and **71d** are the locations where an edge of tape **70** intersects with flat core **700**. Imaginary line **L1** connects points **71a** and **71d**, and imaginary line **L2** connects points **71b** and **71c**. Imaginary lines **L1** and **L2** intersect at point **72** on the surface of tape article **1700**.

Bow and twist are determined by placing the tape article against flat plate **7000**. Figure 7B depicts the case where all of points **71a**, **71b**, **71c**, **71d**, **72** contact flat plate **7000** and the entire tape **70** contacts flat core **700**. In this instance, the bow is defined to be zero and the twist is defined to be zero.

Figures 7C and 7D depict the two situations where the bow is non-zero. In Figure 7C, tape roll **70** does not contact flat plate **7000** at point **72**, but tape roll **70** maintains contact with flat core **700**. In this situation, a vertical distance **A** is measured between point **72** on flat core **700** and flat plate **7000**. The vertical distances between each of points **71a**, **71b**, **71c**, **71d** and flat plate **7000** are also measured, and the shortest of those vertical distances is distance **B**. A clearance **C**, which corresponds to the vertical distance between the inner portion of the tape roll **70** and the nearest of points **71a**, **71b**, **71c**, **71d** on the flat core is calculated by subtracting **B** from **A**.

In the event that tape roll **70** does not maintain contact with flat core **700**, as depicted in Figure 7D, the clearance **C** is calculated directly as the vertical distance between the inner portion of tape roll **70** and point **72** on flat core **700**.

After the clearance is determined the article is then flattened against the flat plate by applying hand pressure until all of points **71a**, **71b**, **71c**, **71d**, **72** contact the plate. The longitudinal length, defined as the distance between **71a** and **71c** or between **71b** and **71d**, is measured in this state.

The percent bow is calculated as the ratio of the clearance **C** to the longitudinal distance, expressed as a percent.

Figure 7E depicts a case where the twist is non-zero, that is, where one of points **71a**, **71b**, **71c**, **71d** (in this Figure **71d**) does not touch flat plate **7000** when the other points **71a**, **71b**, **71c** are in contact with flat plate **700**. Distance **D** is measured as the vertical height of tape roll **70**. Distance **E** is measured as the vertical distance between flat plate **7000** and point **71d** on flat core **700**. Clearance **C** is calculated as the **E** less **D**.

Longitudinal distance is then measured as described above with respect to bow. The percent twist is calculated as the ratio of clearance **C** to the longitudinal distance, expressed as a percent.

It is possible for both the bow and twist to be non-zero, in which case both are determined separately following the procedures described above.

Example 1

A polystyrene core (120 mm long, 60 mm wide, 2 mm thick, purchased from Nippon Tact, Tokyo, Japan) was tested for rigidity. The bending strength was 1.2 N/mm and the slope of the stress strain curve was 0.15 N/mm². Scotch® Brand adhesive packaging tape (48 mm width) was wound around the length of the core. The core projected beyond the tape roll by 6 mm on both sides. After winding, no bow or twist was measurable in the core (that is, the bow and twist were both 0%).

Example 2

A paper core (three layers: two 0.45 mm skin layers of cardboard paper and 1.0 mm intermediate layer of cardboard paper purchased from Suzuki Shiko, Kanagawa Japan; total dimensions 120 mm long, 60 mm wide, 2 mm thick) was tested for rigidity. The bend strength was 0.56 N/mm and the slope of the stress strain was 0.095 N/mm². Scotch® Brand adhesive packaging tape (48 mm width) was wound around the length of the core. The core projected beyond the tape roll by 6 mm on both sides. After winding, no bow or twist was measurable in the core (that is, the bow and twist were both 0%).

Example 3

Notches (51 mm wide and 2.5 mm deep) were cut in the 60 mm edges of a paper core described in Example 2. Scotch® Brand adhesive packaging tape (48 mm width) was wound around the length of the core so that the tape was disposed in the notches. The core projected beyond the tape roll by 6 mm on both sides, and by approximately 1 mm in the length. After winding, no bow or twist was measurable in the core (that is, the bow and twist were both 0%).

Comparative Example 1

A polystyrene core that is identical to that of Example 1 except that it had a thickness of 1 mm was tested for rigidity. The bend strength was 0.29 N/mm² and the slope of the SS curve was 0.022 N/mm².

A Scotch® brand packaging tape (48 mm width) (3M Company, St. Paul MN USA) was wound around the core. Approximately 5 minutes after winding, the article to be noticeably bowed with a 7.9% (9.5 mm) bend in the core and corresponding bend in the tape that was wound around the core.

Comparative Example 2

A corrugated paper core (120 mm length, 60 mm width, 2.5 mm thick) was provided. Scotch® Brand adhesive packaging tape (48 mm width) (3M Company, St. Paul MN USA) was wound around the length of the core. The core projected beyond the tape roll by 6 mm on both

sides. After winding, the visual inspection by a human detected no perceivable bow or twist in the core. The core was then cut down its length next to the tape on one side so that the core did not project beyond the edge of the tape on that side; the side without the core projection is referred to as the “unprotected side.”

Example 4

An edge protection experiment was conducted on the article of Example 1 as follows. Tape samples were placed on a surface in a holder, edge side up. A brass brush weighting 100 g was hung 50 cm above the surface. The brush was allowed to fall on the tape edge. This was repeated 10 times for each sample. The tensile strength of the tape and elongation of the tape roll were measured.

Comparative Example 3

The text described in Example 4 was performed on the unprotected side of the article of Comparative Example 2.

Reference Example 1

The tensile strength and elongation of Scotch™ brand Tear by Hand Low Noise tape (available from 3M Company, MN, USA) was determined.

The results of Example 4 (“EX. 4”), Comparative Example 3 (“CEX. 3”), and Reference Example 1 (“REX. 1”) are reported in Table 1. In Table 1, “avg” stands for “average” and means the arithmetic mean, and “StD” stands for “Standard Deviation.” Tensile strengths are reported in units of N/10 mm and elongation is reported as a percent.

Table 1

		Experimental Results		
		EX. 4	CEX. 3	REX. 1
Tensile Strength	avg	34.5	33.55	36.77
	StD	0.96	1.62	1.71
Elongation	avg	66.42	29.15	66.92
	StD	11.71	16.4	9.53

What is claimed is:

1. A tape article comprising

a flat core having a bend strength of no less than 0.4 N/mm and a strain stress curve comprising a liner portion with a slope of 0.04N/mm² or greater when tested according to JIS K7171, the core comprising

a first major surface and an opposing second major surface,

a first core edge and an opposing second core edge, the second core edge being essentially parallel to the first core edge,

a core width defined by the shortest distance from the first edge to the second edge, and

a third core edge and an opposing fourth core edge; and

a tape roll comprising

a tape, the tape comprising

a backing material having first side and opposing second side, and

a first tape edge and opposing second tape edge, and

a tape roll width defined by the shortest distance between the first tape edge and the second tape edge; wherein

the tape is in a wound disposition in successive layers of tape around the core from the third core edge to the fourth core edge,

the core width is greater than the tape roll width,

the first core edge extends beyond the first tape edge, and

the second core edge extends beyond the second tape edge.

2. The article of claim 1, wherein the tape roll comprises

the tape roll having a roll height defined by the longest distance between one of the first major surface, second major surface, third core edge, or fourth core edge and the exterior portion of tape; and

at least one of the third core edge and the fourth core edge comprising a notch; wherein

the tape roll is disposed within the notch, and

the notch depth is no less than the roll height.

3. The article of any of the preceding claims, wherein the tape roll is substantially free of visible air pockets.

4. The article of any of the preceding claims, further comprising a first adhesive coating on the first side of the backing material, wherein the first adhesive is optionally a pressure sensitive adhesive.

5. The article of claim 4, further comprising a liner on the first adhesive coating.

6. The article of any of the preceding claims, further comprising a second adhesive coating on the second side of the backing material.

7. The article of any of claims 1-5, further comprising a low adhesive backsize on the second side of the backing material.

5 8. The article of any of the preceding claims, wherein at least one of the first adhesive and the second adhesive is a pressure sensitive adhesive.

9. The article of any of the preceding claims, wherein the tape comprises at least one perforation.

10. The article of any of claims 1-8, wherein the tape is hand-tearable and does not have perforations.

10 11. The article of any of the preceding claims, wherein the backing material comprises paper.

12. The article of any of the preceding claims wherein the backing material comprises yarn or fiber.

13. The article of any of the preceding claims, wherein the backing material comprises polypropylene.

15 14. The article of any of the preceding claims, wherein the backing material is coated, laminated, or saturated with polymer.

15. The article of any of the preceding claims, wherein the backing material comprises bi-axially oriented polypropylene.

20 16. The article of any of the preceding claims, wherein the backing material is laminated with mono-axially oriented polypropylene.

17. The article of any of the preceding claims, wherein the backing material is transparent or translucent to the human eye.

18. The article of claim 17, wherein the backing material is transparent to the human eye.

25 19. The article of any of the preceding claims, wherein the tape is transparent tape, duct tape, masking tape, painter's tape, packaging tape, carton sealing tape, or electrical tape.

20. The article of any of claims 1-3 or 9-19, wherein the tape does not have an adhesive.

21. The article of claim 20, wherein the tape is plumber's tape, bandage, athletic wraps, poly(tetrafluoroethylene) tape, or gauze.

30 22. The article of any of the preceding claims, wherein the flat core has a bend strength of 40 N/mm² or less when tested according to JIS K7171.

23. The article of any of the preceding claims, wherein the flat core has a slope of the linear portion of the stress strain curve is 40 N/mm² or less.

35 24. The article of any of the preceding claims, wherein the article has a bow of 5% or less, optionally 4.2% or less, optionally 4% or less, optionally 3% or less, optionally 2% or less, or optionally 1% or less.

25. The article of any of the preceding claims, wherein the article has a twist of 5% or less, optionally 4.2% or less, optionally 4% or less, optionally 3% or less, optionally 2% or less, or optionally 1% or less.

5 26. A method of using an article of any of the preceding claims the method comprising unwinding at least a portion of the tape from the flat core and tearing or cutting the at least a portion tape.

27. The method of claim 26, further comprising adhering the cut or torn at portion of tape to an article.

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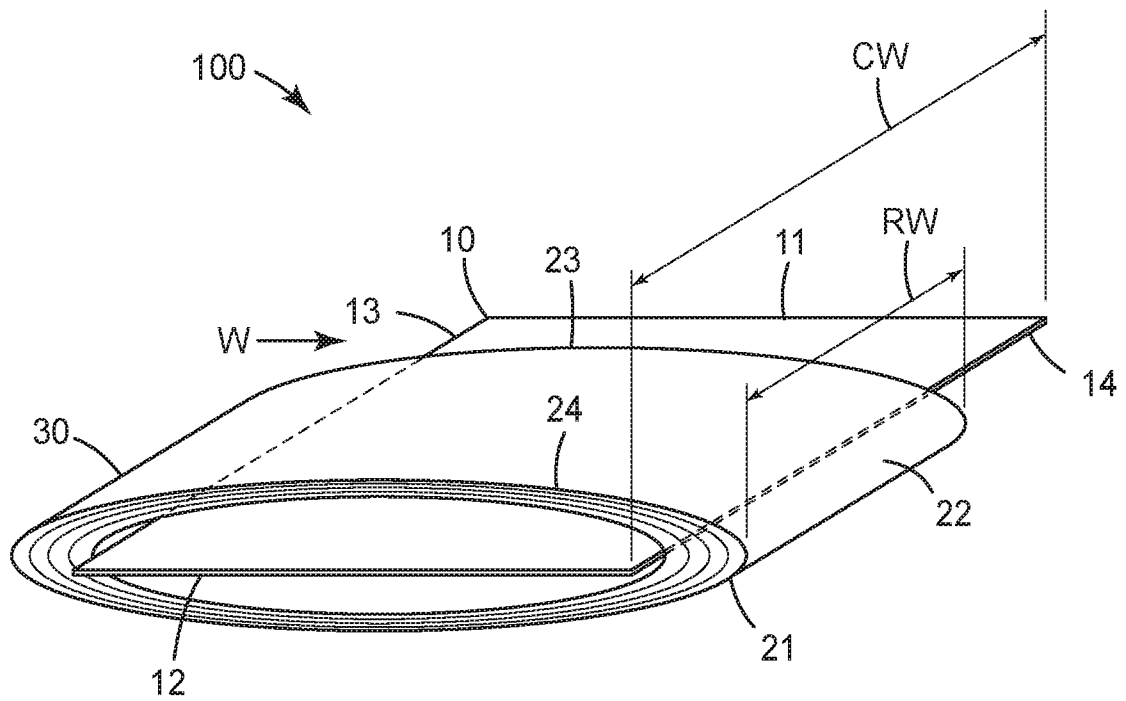
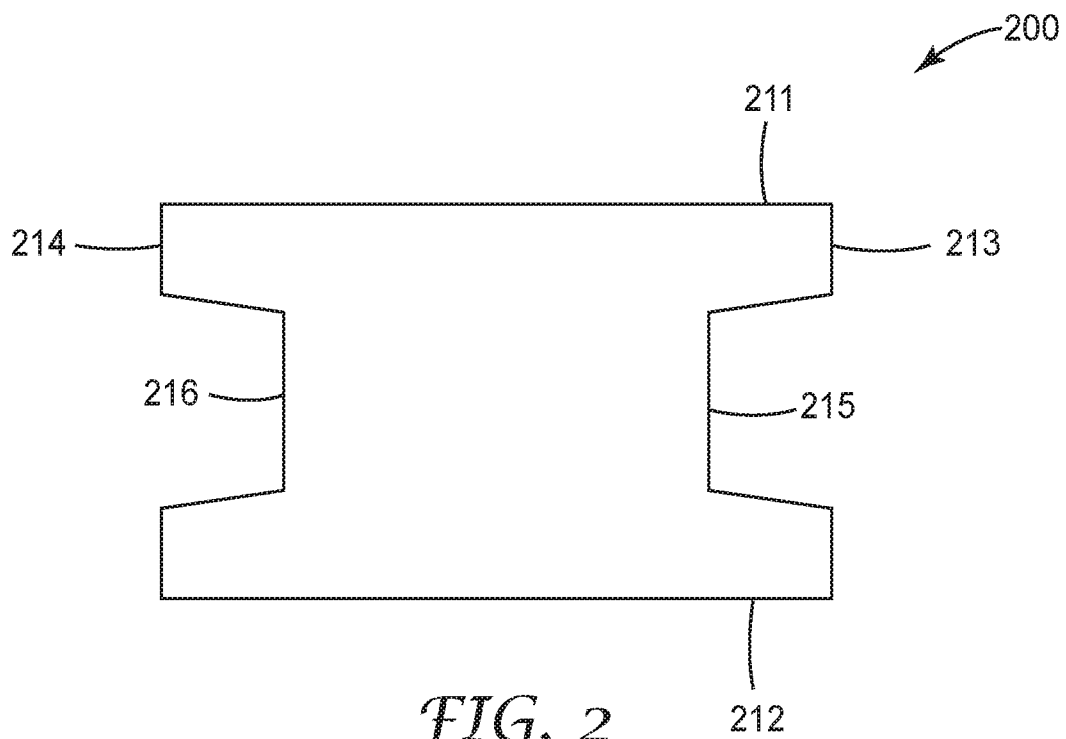


FIG. 1



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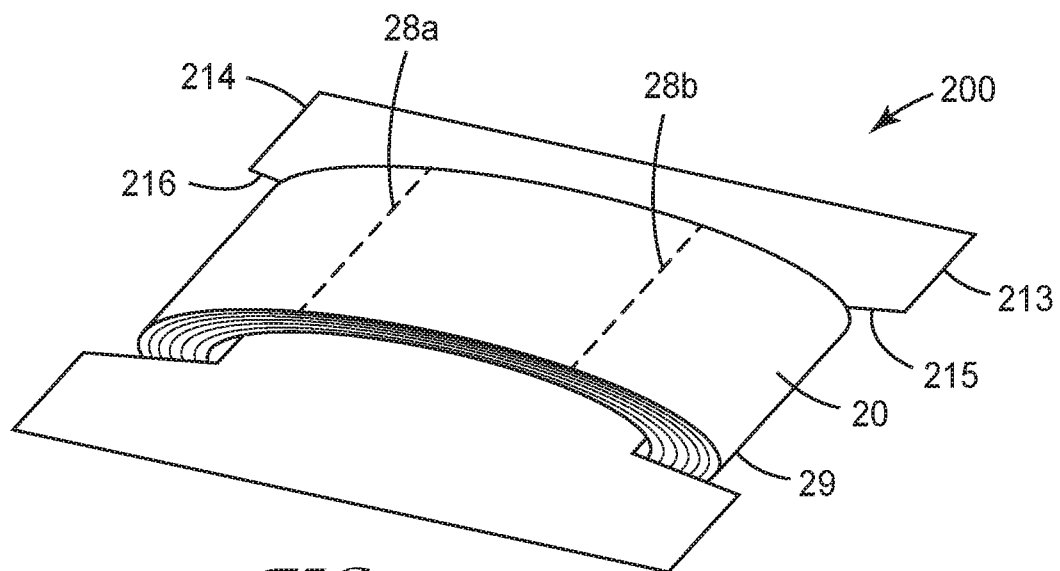


FIG. 3

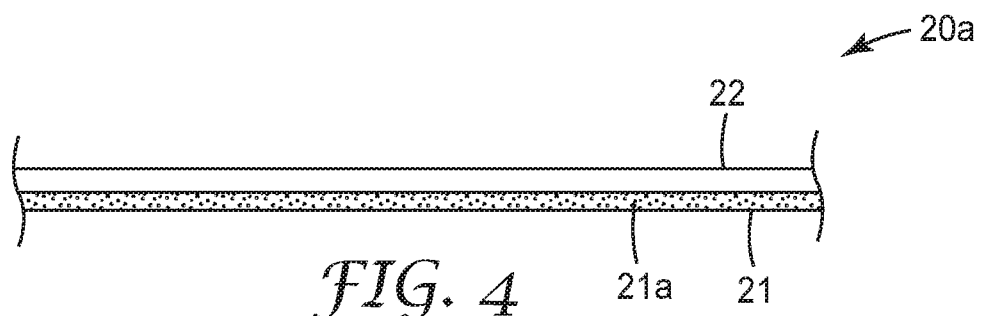


FIG. 4

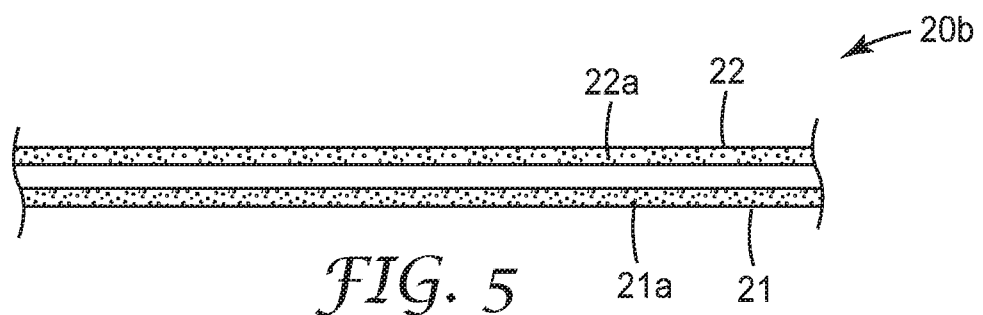


FIG. 5

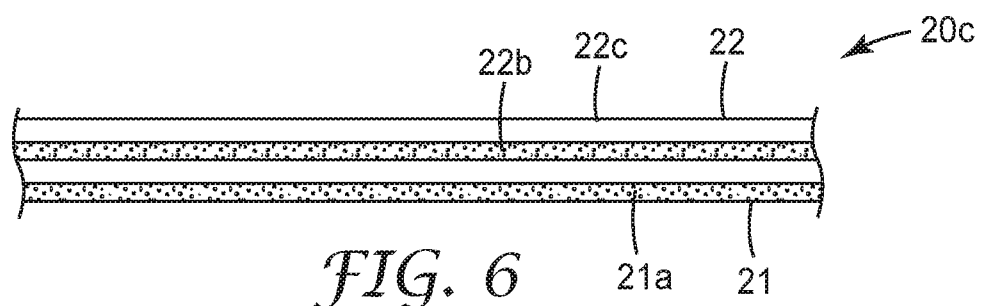


FIG. 6

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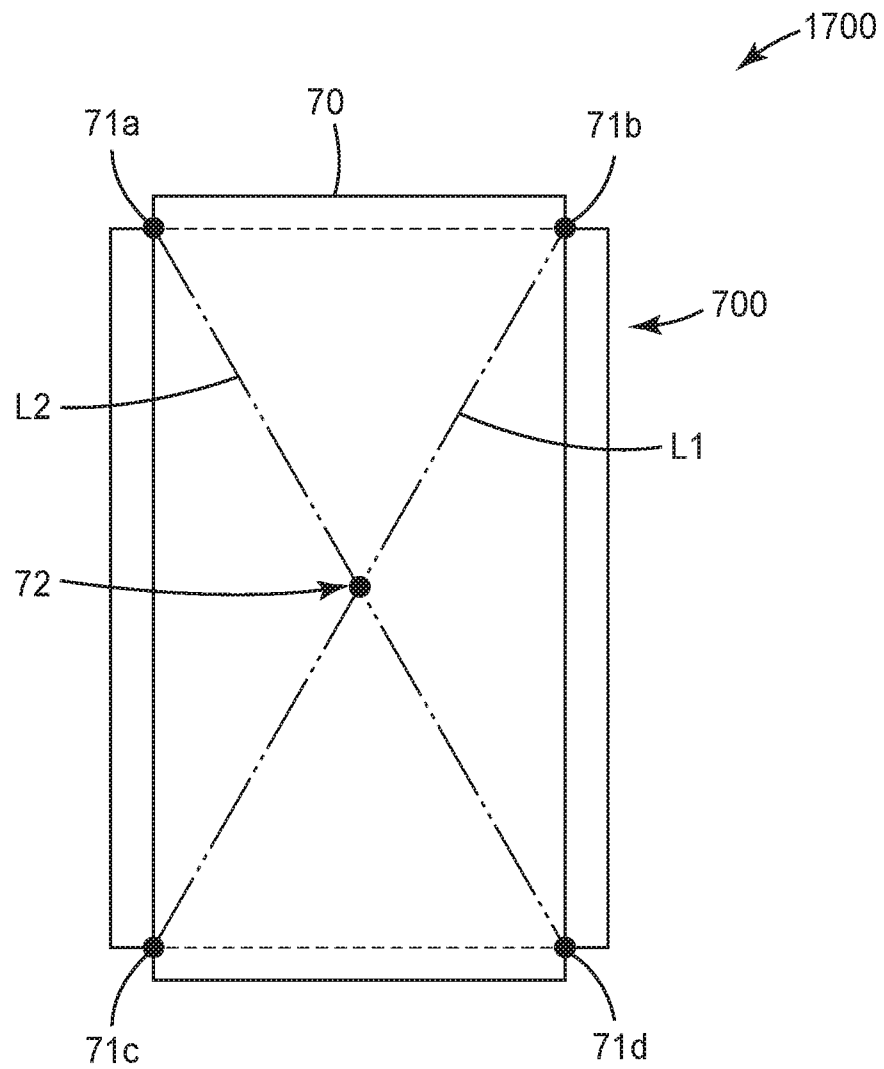
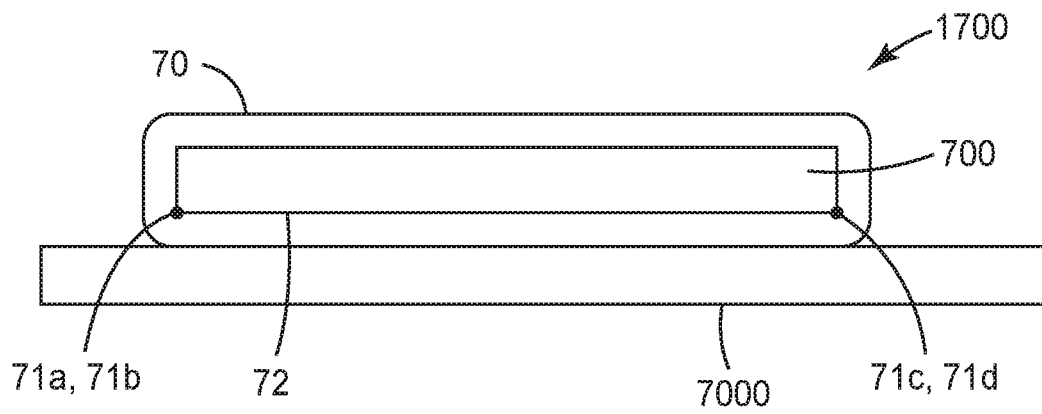
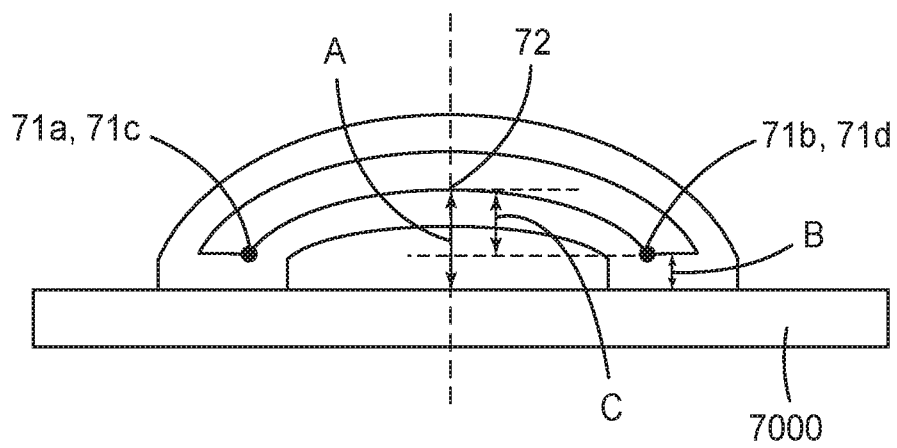


FIG. 7A

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*FIG. 7B**FIG. 7C*

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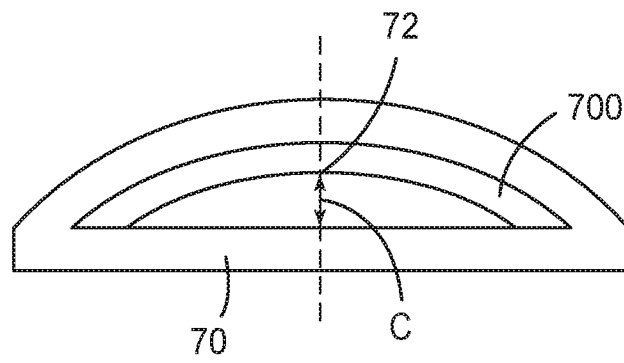


FIG. 7D

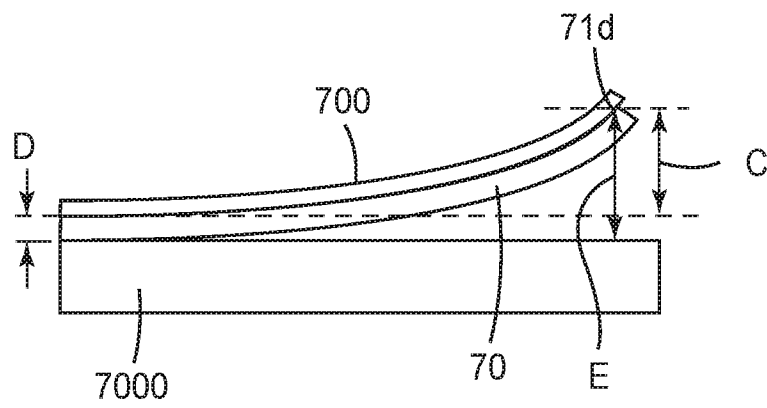


FIG. 7E

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2020/057204

A. CLASSIFICATION OF SUBJECT MATTER
 INV. B65H18/28 B65H35/00 B65H75/06
 ADD.

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)
 B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/055410 A2 (3M INNOVATIVE PROPERTIES CO [US]) 18 July 2002 (2002-07-18) abstract; figures 4-8 page 4, lines 14-20 the whole document	1-27
X	JP S52 47092 U (.) 2 April 1977 (1977-04-02) figure 1 paragraphs [0001], [0002]	1-27
X	GB 2 017 047 A (PLANT & SON LTD G H) 26 September 1979 (1979-09-26) abstract; figures 1,2 page 1, lines 5-10, 80-100 the whole document	1-21,26, 27
	-/-	



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

21 October 2020

Date of mailing of the international search report

30/10/2020

Name and mailing address of the ISA/

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Piekarski, Adam

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2020/057204

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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