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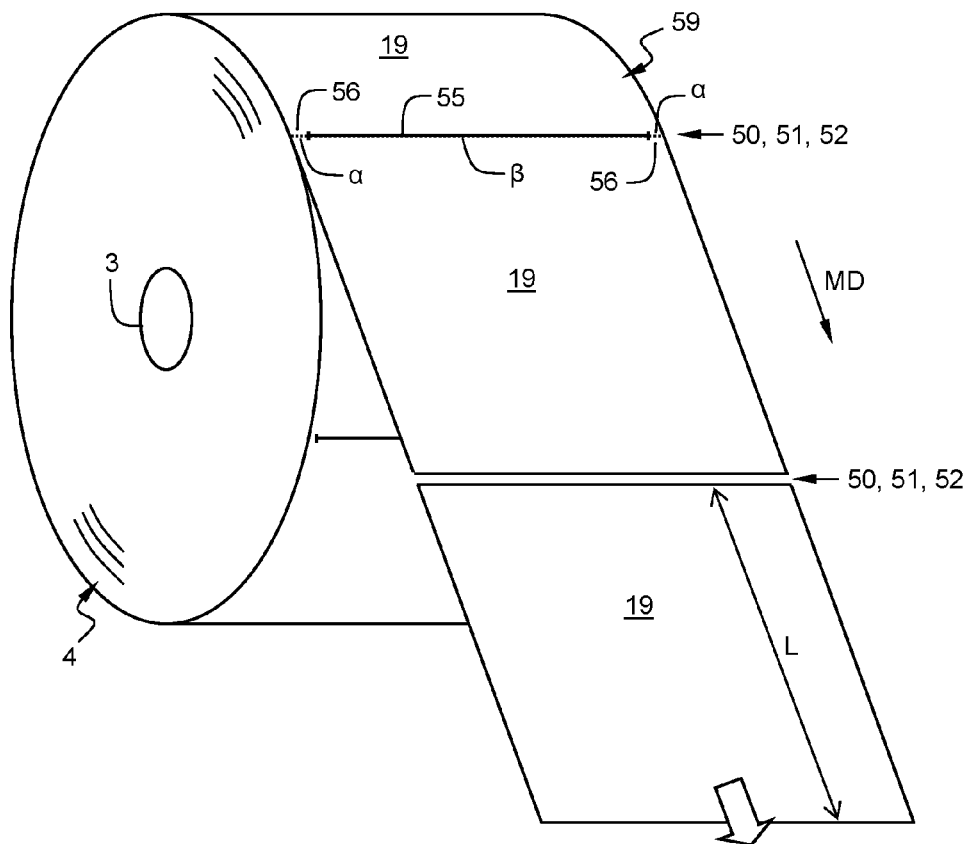
- (57)
- ABSTRACT**

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A sheet of absorbent material having opposite sheet side edges spaced apart from one another to define an overall width of the absorbent sheet, the sheet of absorbent material including zones of weakness spaced along the sheet of absorbent material according to a machine direction, each zone of weakness extending substantially transversally to said machine direction, each zone of weakness defining two adjacent individual absorbent sheet portions, each zone of weakness being a tear line. The tear line comprises two edge regions and a central region, a first edge region beginning at one of the sheet side edges towards the central region, a second edge region beginning at the other sheet side edges towards the central region, the central region including alternating perforated segments and unperforated segments. The edge regions are unperforated so as to constitute attachment areas within the tear line between two adjacent individual absorbent sheet portions.



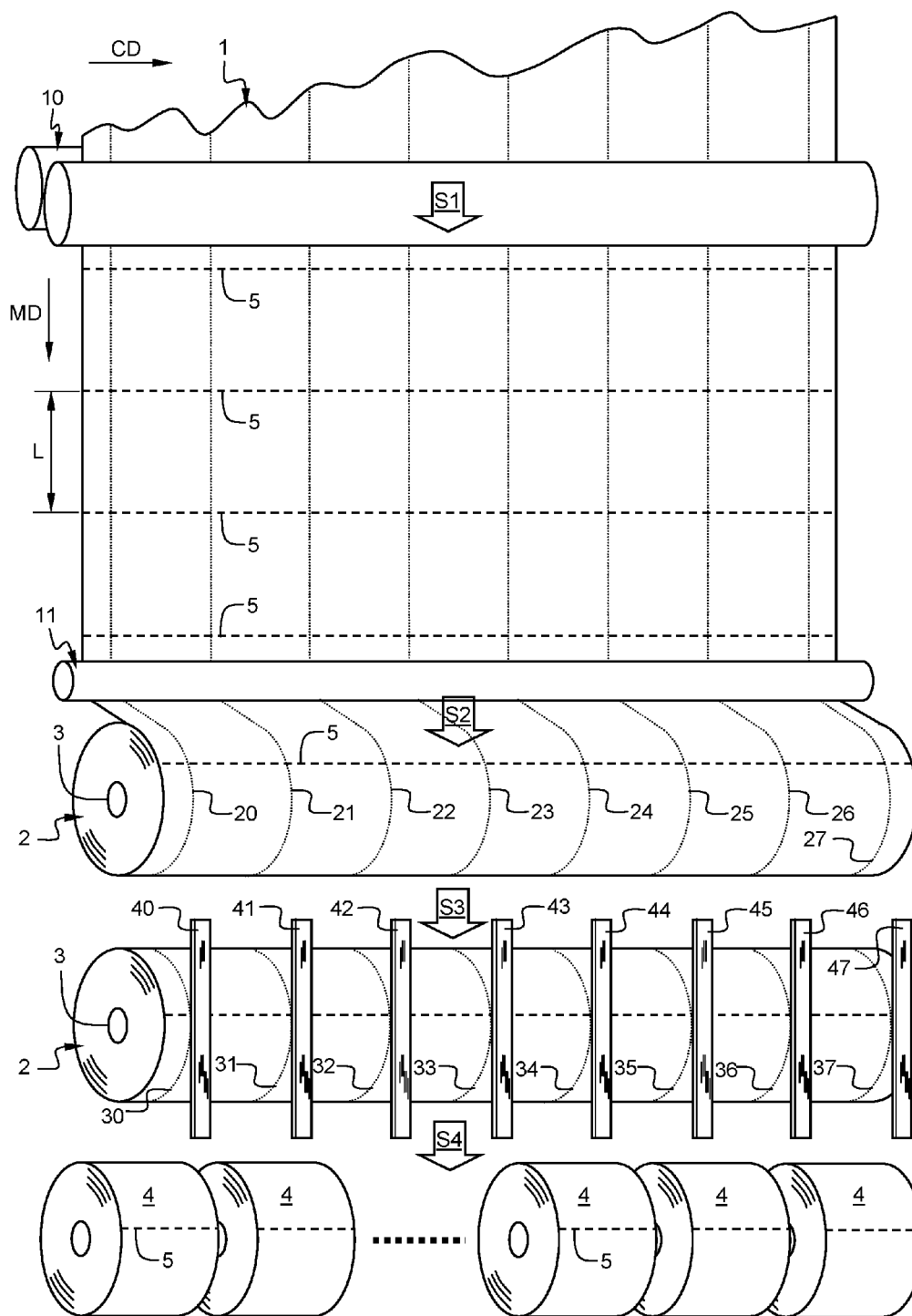


FIG. 1 - PRIOR ART

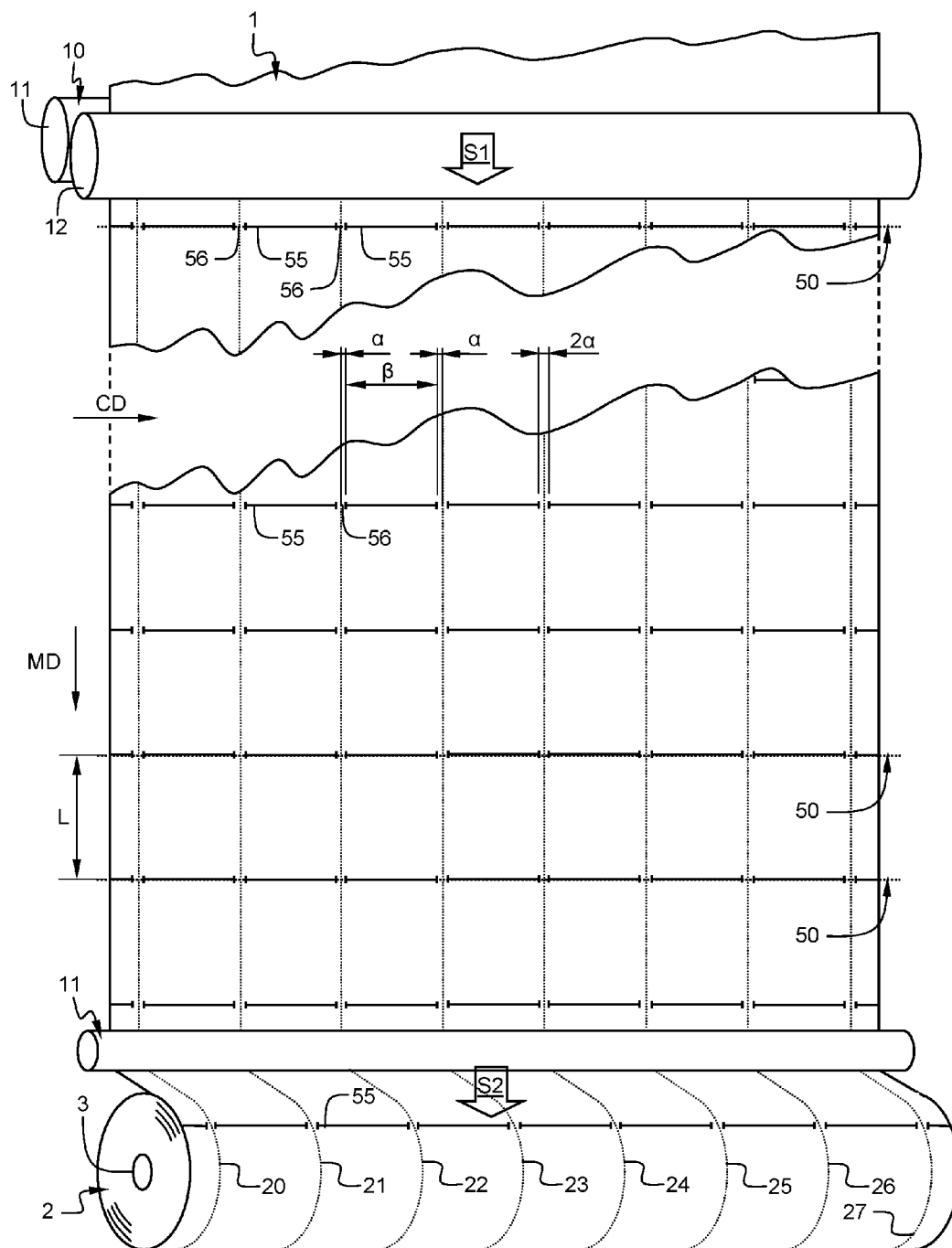


FIG. 2

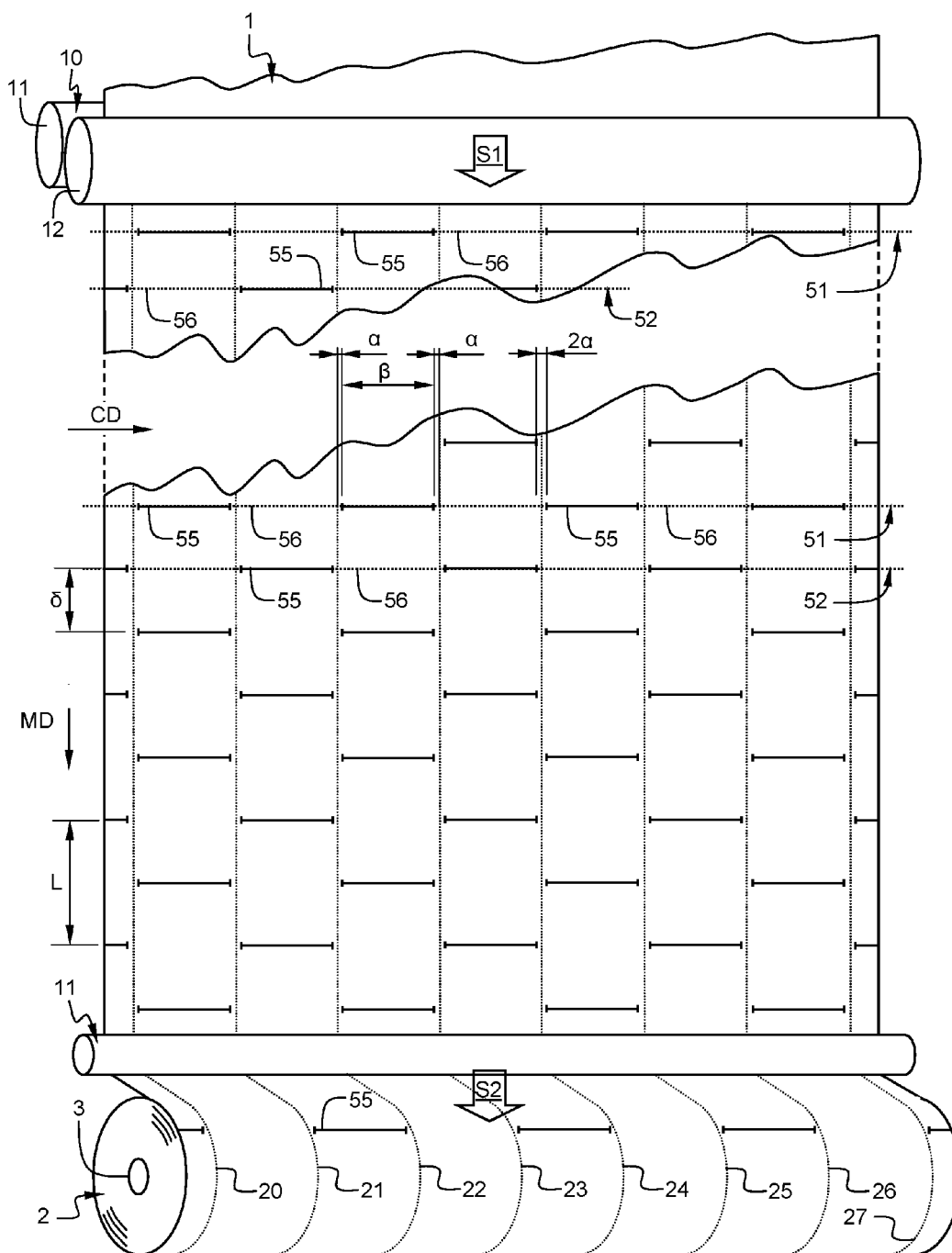
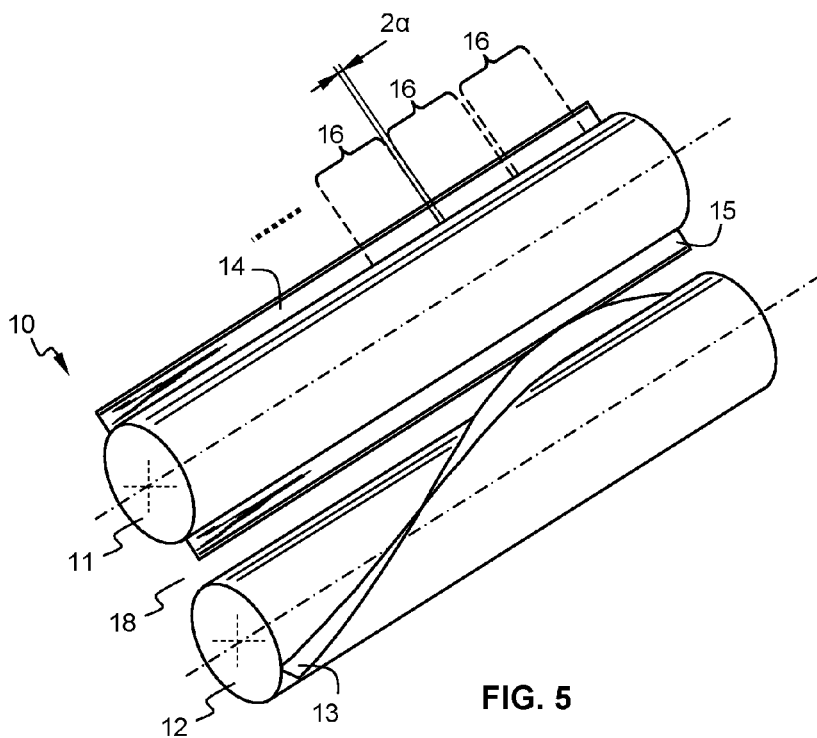
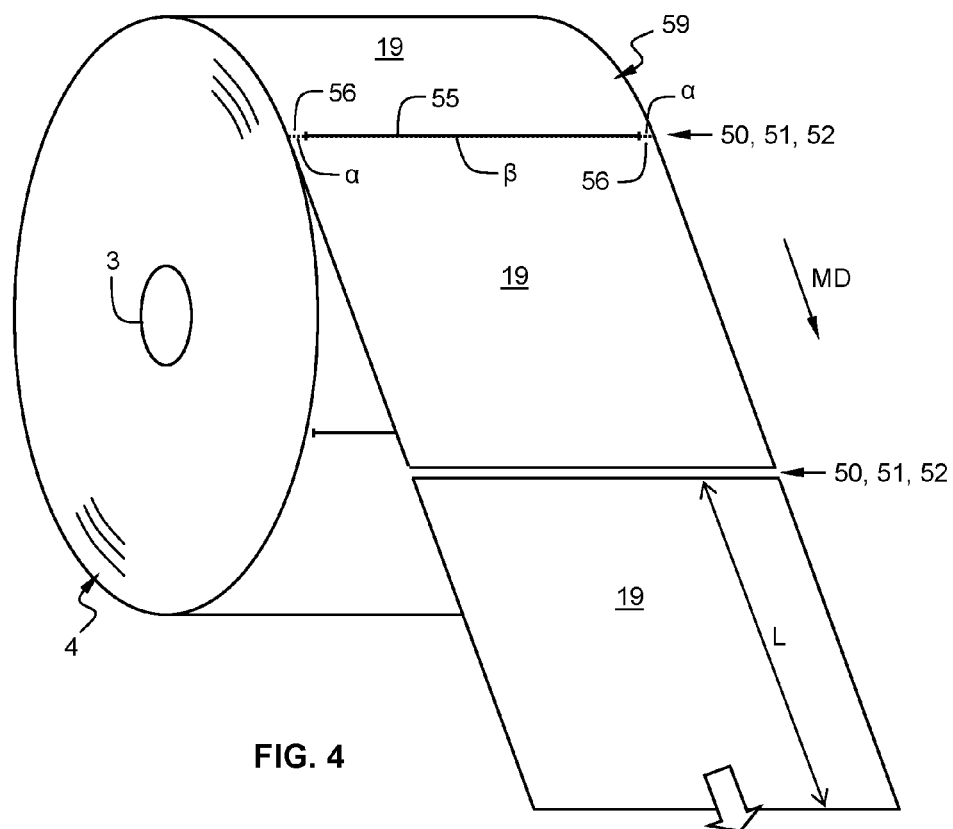
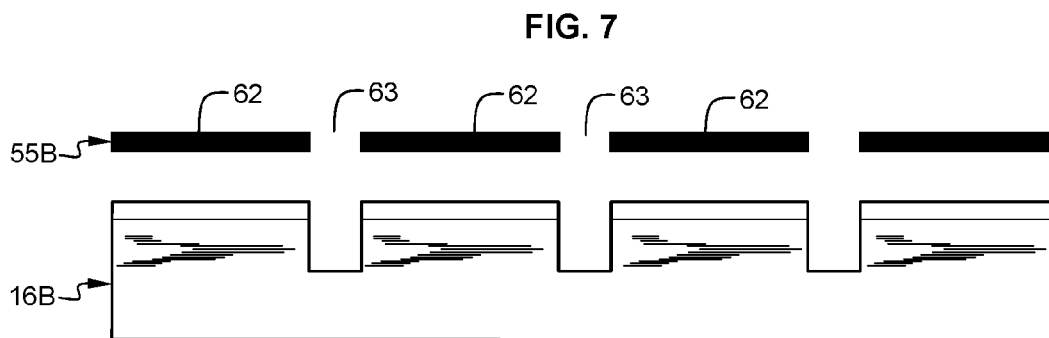
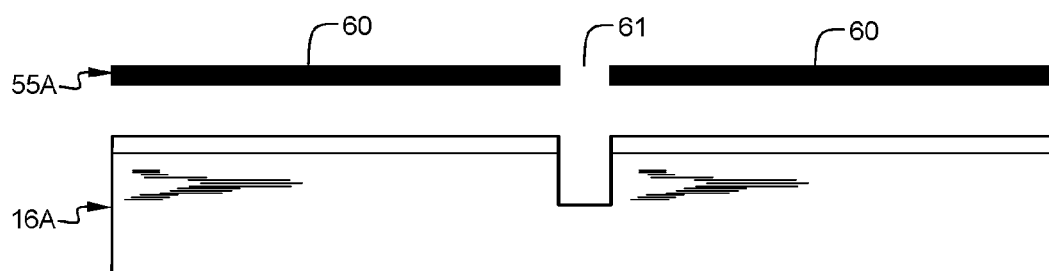
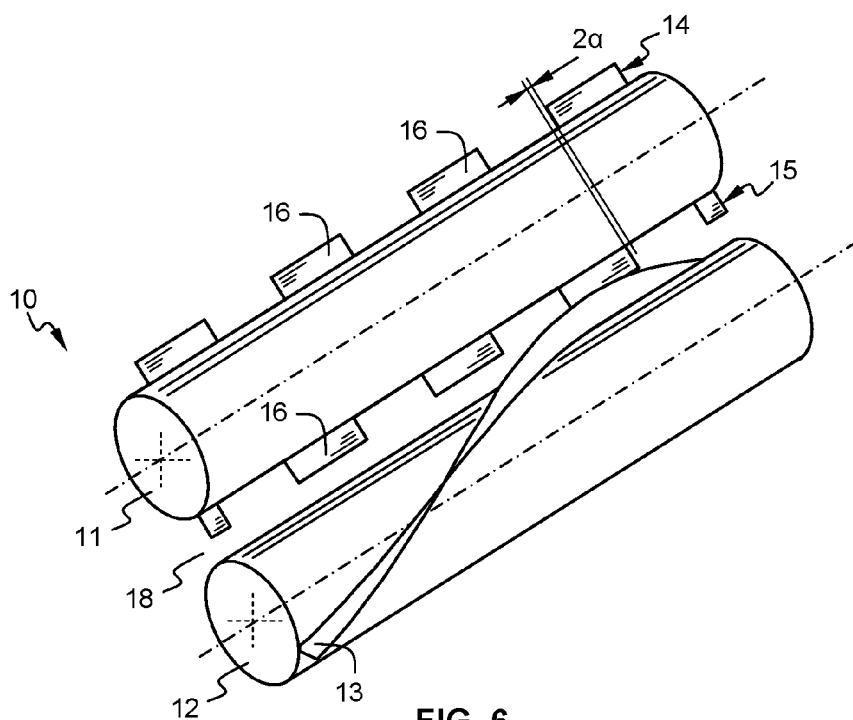


FIG. 3





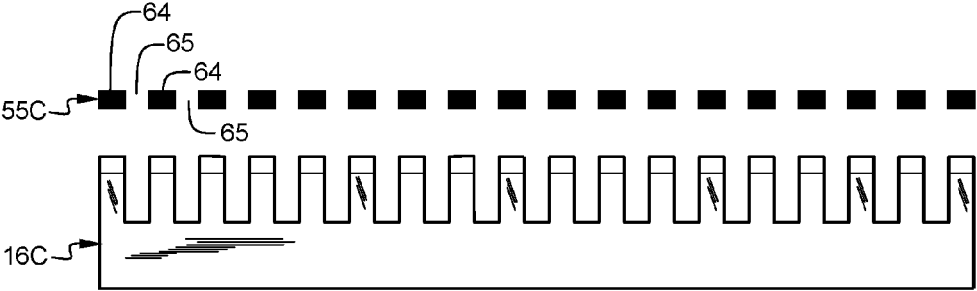


FIG. 9

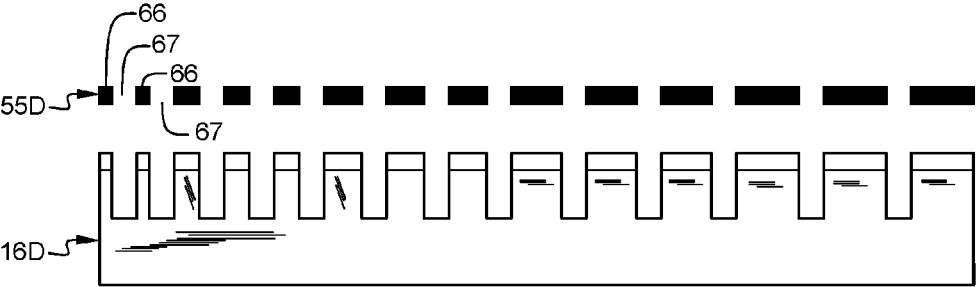


FIG. 10

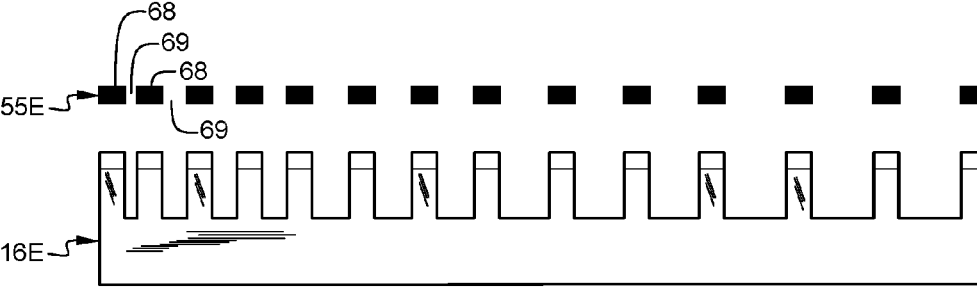


FIG. 11

A SHEET OF ABSORBENT MATERIAL, ROLL, LOG AND METHOD FOR MANUFACTURING THE SAME

TECHNICAL FIELD

[0001] An aspect relates to a sheet of absorbent material and sheet of absorbent material wound as a roll. Another aspect relates to a log base sheet made of absorbent material used to manufacture such rolls. Still another aspect relates to a method for manufacturing a roll of sheet of absorbent material. The sheet of absorbent material may be manufactured from a web of tissue paper (obtained by a Conventional Wet Press or Through Air Drying manufacturing method or other manufacturing method) or a nonwoven fabric (obtained by an air-laid manufacturing method or spun-laid manufacturing method or other manufacturing method). Such absorbent sheet products find a particular, though non-exclusive, use as sanitary or domestic purposes. As an example, such absorbent sheet products may be used as paper towel, toilet tissue, bathroom tissue, facial tissue, wiping tissue, kitchen tissue, etc.

BACKGROUND

[0002] A tissue paper relates to an absorbent paper based on cellulose fibers which is also called tissue paper base-sheet in this field of technology. A typical absorbent paper has a low basis weight, in the range from 10 to 50 g/m².

[0003] A nonwoven fabric comprising cellulosic fibers relates to an absorbent paper which is also called nonwoven or web made of fibers like air-laid web in this field of technology. A typical absorbent paper has a basis weight, in the range from 30 to 250 g/m², preferably 40 to 200 g/m².

[0004] FIG. 1 schematically illustrates a method for manufacturing a roll of absorbent sheet material 4 according to the prior art. More precisely, at the stage of FIG. 1, an absorbent base sheet 1 has already been produced according to a known papermaking process. FIG. 1 illustrates a later stage which is a stage where a converting process takes place. The converting process converts large parent base sheet 1 (e.g., strip width from 1.80 m to 7 m) into retail sized rolls 4, e.g., bathroom tissue rolls, paper towels rolls e.g., strip width from 8 to 40 cm). More precisely, the base sheet 1 is fed into a space of a perforating unit 10 comprising a perforator roll and a stationary anvil roll. There, the base sheet 1 is pinched (step S1) with the desired tear lines 5 (schematically represented by dashed lines). A tear line 5 is a line according to a cross-machine direction CD made in the thickness of the base sheet 1 and comprising alternating perforated segments and unperforated segments (i.e. two perforated segments being separated by one unperforated segment or vice-versa). Each unperforated segment forms an attachment area between two consecutive portions (according to the machine direction MD) of the base sheet. Each perforated segment forms a detachment area between two consecutive portions (according to the machine direction MD) of the base sheet. Two consecutive tear lines 5 define the individual sheet length L in the rolls of absorbent material sheet 4, e.g., typically a sheet of a bathroom tissue rolls may have a length of around 33 cm. In FIG. 1, multiple phantom lines 20-27 parallel to the machine direction MD are also represented on the base sheet 1 for the sole purpose of illustration. The phantom lines 20-27 are spaced apart in the cross-machine direction CD. They schematically represent imaginary lines

where the base sheet 1 will be cut into multiple and individual rolls of absorbent material sheet 4. The distance between two consecutive phantom lines is equal to the full width of the individual rolls 4. After the pinching step (S1), the perforated base sheet 1 is wound (step S2) onto a core 3 in order to form a wound log 2 by means of a rewinding unit 11. Various types of rewinding unit are commonly used in the tissue industry, for example center rewinders or surface rewinders. Once the desired log diameter (corresponding to a substantially defined number of individual sheets wound in the log) is reached, the base sheet 1 is cut. The produced log 2 is separated (step S3) from the base sheet 1 and subsequently a new log begins to be produced. A loose end forming a tail of the base sheet of the produced log 2 is adhered to the log in a known manner. The produced log 2 is then cut (step S4) by multiple log saws 40-47 into multiple and individual rolls of absorbent material sheet 4. The corresponding cuts in the produced log 2 are represented by multiple phantom lines 30-37 on the surface of the produced log 2.

[0005] In the tissue industry, the mass production throughput constraints imply a typical speed and tension of the converting process. For example, the speed may be set at 650 m/min. At such a speed, the tension in the parent base sheet required to wound the roll may exceed the tensile strength of the tear lines. This results in base sheet blowouts, namely breaks in the base sheet along some of the tear lines. It is known to adjust the tensile strength of the tear lines to solve this issue. However, increasing the tensile strength of the tear lines may result in rolls that are not satisfactory for the user or not adapted to the dispenser. Indeed, they would require applying an unacceptable pulling force in order to properly detach the individual sheets from the roll along the tear lines.

[0006] The document U.S. Pat. No. 6,010,090 relates to a method of perforating a web. An elongated web of paper is perforated along a plurality of transverse lines to provide bands of web areas having relatively high tensile strength which extend generally longitudinally along the web. The lines of perforation can be formed by staggered perforation lines which contain groups of perforations which are separated by unperforated areas or by staggered perforation lines which include groups of perforations having relatively low tensile strength which are separated by groups of perforations having relatively high tensile strength.

[0007] Thus, there is a need to improve the method for manufacturing a roll of absorbent sheet material and/or the way of coupling the individual sheets together in the roll of absorbent sheet material for an easy dispensing. Further, this should be obtained in economical or cost effective manner.

SUMMARY

[0008] It is an object of embodiments of the invention to propose a manufacturing method that overcomes the drawbacks of the manufacturing method of the prior art. It is another object of embodiments of the invention to propose a roll method that overcomes the drawbacks of the rolls of the prior art.

[0009] According to one aspect, there is provided a sheet of absorbent material having opposite sheet side edges spaced apart from one another to define an overall width of the sheet of absorbent material, the sheet of absorbent material comprising zones of weakness spaced along the sheet of absorbent material according to a machine direction,

each zone of weakness extending substantially transversally to said machine direction, each zone of weakness defining two adjacent individual absorbent sheet portions, each zone of weakness being a tear line,

[0010] wherein

[0011] the tear line comprises two edge regions and a central region, a first edge region beginning at one of the sheet side edges towards the central region, a second edge region beginning at the other sheet side edges towards the central region, the central region comprising alternating perforated segments and unperforated segments,

[0012] said edge regions are unperforated so as to constitute attachment areas within the tear line between two adjacent individual absorbent sheet portions.

[0013] A width ratio of the edge regions relatively to the central region may range from about 4% to about 20%.

[0014] An edge region width may range from about 3 mm to about 10 mm.

[0015] The central region may comprise alternating perforated segments and unperforated segments according to a perforation pattern comprising at least two perforated segments separated by one unperforated segment, each segment having substantially an identical width.

[0016] The central region may comprise alternating perforated segments and unperforated segments according to a perforation pattern comprising multiple perforated segments, two adjacent perforated segments being separated by one unperforated segment, each perforated segment having a width increasing from one side edge towards the opposite side edge, each unperforated segment having a constant width.

[0017] The central region may comprise alternating perforated segments and unperforated segments according to a perforation pattern comprising multiple perforated segments, two adjacent perforated segments being separated by one unperforated segment, each unperforated segment having a width increasing from one side edge towards the opposite side edge, each perforated segment having a constant width.

[0018] According to another aspect, there is provided a roll of absorbent material sheet comprising a sheet of absorbent material according to an embodiment of the invention wound onto a core or on itself.

[0019] According to still another aspect, there is provided a use of the sheet of absorbent material according to an embodiment of the invention for manufacturing absorbent sheet products chosen among the group comprising napkins, towels, kitchen towels, hand towels, toilet papers, wipes and facial tissues.

[0020] According to still a further aspect, there is provided a log base sheet made of absorbent material having opposite log side edges spaced apart from one another to define an overall width of the log base sheet, the log base sheet comprising zones of weakness spaced along the log base sheet according to a machine direction MD of the log base sheet, each zone of weakness extending substantially transversally to said machine direction, each zone of weakness being a tear line, the log base sheet comprising multiple phantom lines parallel to the machine direction representing imaginary lines for cutting the log base sheet,

[0021] wherein:

[0022] the tear line comprises multiple successions of first edge region, a central region and a second edge region from one of the log side edge towards the other log side

edge, the central region comprising alternating perforated segments and unperforated segments,

[0023] said edge regions are unperforated, and

[0024] each phantom line is positioned at a boundary between two adjacent edge regions so as to constitute attachment areas within said tear line between two adjacent central regions.

[0025] A central region out of two in each tear line may be replaced by an unperforated region, and wherein two consecutive tear lines are staggered according to a cross-machine direction CD such that all the central region are positioned between two adjacent phantom lines.

[0026] According to still another aspect, there is provided a log of absorbent material sheet comprising a log base sheet made of absorbent material according to an embodiment of the invention wound onto a core or on itself.

[0027] According to still a further aspect, there is provided a method for manufacturing a roll of sheet of absorbent material comprising the steps of:

[0028] feeding a log base sheet made of absorbent material into a perforating unit, the log base sheet having opposite log side edges spaced apart from one another to define an overall width of the log base sheet;

[0029] defining zones of weakness spaced along the log base sheet according to a machine direction MD of the log base sheet, each zone of weakness extending substantially transversally to said machine direction MD, by pinching each zone of weakness as a tear line;

[0030] defining multiple phantom lines (20-27) in the log base sheet parallel to the machine direction MD representing imaginary lines for cutting the log base sheet;

[0031] wounding the pinched log base sheet onto a core or on itself to form a log;

[0032] cutting the pinched log base sheet once a desired log diameter is reached;

[0033] cutting the log into multiple and individual rolls of absorbent material sheet;

[0034] pinching each tear line as multiple successions of first edge region, a central region and a second edge region from one of the log side edge towards the other log side edge, the central region comprising alternating perforated segments and unperforated segments;

[0035] unperforating said edge regions; and

[0036] positioning each phantom line at a boundary between two adjacent edge regions so as to constitute attachment areas within said tear line between two adjacent central regions.

[0037] Optionally, A central region out of two in a tear line may be replaced by an unperforated region, and wherein two consecutive tear lines are staggered according to a cross-machine direction CD such that all the central region are positioned between two adjacent phantom lines.

[0038] With certain embodiments of the invention, it is possible to improve the method for manufacturing a roll of absorbent material sheet and/or the way of coupling the individual sheets together in the roll for an easy dispensing.

[0039] Other advantages will become apparent from the hereinafter description of embodiments of the invention.

[0040] BRIEF DESCRIPTION OF THE DRAWINGS

[0041] Embodiments of the present invention are illustrated by way of examples and not limited to the accompanying drawings, in which like references indicate similar elements:

[0042] FIG. 1 schematically illustrates a method for manufacturing a roll of sheet of absorbent material according to the prior art;

[0043] FIG. 2 schematically and partially illustrates a method for manufacturing a log of sheet of absorbent material according to a first exemplary embodiment of the invention;

[0044] FIG. 3 schematically and partially illustrates a method for manufacturing a log of sheet of absorbent material according to a second exemplary embodiment of the invention;

[0045] FIG. 4 is a perspective view schematically illustrating a roll of sheet of absorbent material manufactured according to the first or second embodiment;

[0046] FIGS. 5 and 6 are perspective views schematically illustrating a perforating unit for the first and second exemplary embodiment, respectively; and

[0047] FIGS. 7 to 11 schematically illustrate various perforating patterns (top part) and corresponding knife (bottom part) for the perforating unit illustrated in FIGS. 5 and 6.

DETAILED DESCRIPTION

[0048] FIG. 2 schematically and partially illustrates the method for manufacturing a log of sheet of absorbent material according to a first exemplary embodiment of the invention. More precisely, FIG. 2 schematically and partially shows a converting operation taking place after a base sheet 1 has been produced by a paper making machine. At this stage, the base sheet 1 is fed into a converting line.

[0049] In FIG. 2, multiple phantom lines 20-27 parallel to the machine direction MD are also represented on the base sheet 1 for the sole purpose of illustration. The phantom lines 20-27 are spaced apart in the cross-machine direction CD. Each phantom line schematically represents an imaginary line where the base sheet 1 will be cut at the end of the converting process in order to form a plurality of individual rolls of sheet of absorbent material. Thus, two adjacent phantom lines define the future edges of the individual roll. The distance between two consecutive phantom lines is equal to the full width of the individual roll.

[0050] The base sheet 1 is fed into the space of the perforating unit 10, namely between a perforator roll 11 and an anvil roll 12 of the perforating unit 10. The perforating unit 10 will be described in details in relation with FIGS. 5 and 6. The base sheet 1 is pinched (step S1) with the tear lines 50 (schematically represented by dotted lines). The tear line 50 is a line according to a cross-machine direction CD (i.e. transversally to the machine direction MD) made in the thickness of the base sheet 1 that constitutes a zone of weakness. According to an embodiment of the invention, the tear line 50 comprises two edge regions 56 and a central region 55. A first edge region begins at one of the sheet side edges towards the central region 55. A second edge region begins at the other sheet side edges towards the central region 55. The central region 55 comprises alternating perforated segments and unperforated segments. The two edge regions 56 are short unperforated segments. The central region 55 comprises alternating perforation segments having a particular perforating pattern. The perforating pattern of the perforation segments 55 will be described in details in relation with FIGS. 7 to 11. The short unperforated segments of the two edge regions 56 are crossed substantially in the middle by a corresponding phantom line 20-27 or, in other word, each phantom line 20-27 is positioned at a boundary

between two adjacent edge regions 56. Each perforation segment 55 is positioned in the middle of the full width defined by two adjacent phantom lines (e.g., 21 and 22), more precisely at a distance α from both phantom lines that defines the future edges of the individual roll. Thus, the length of the short unperforated segments 56 in the cross direction CD is noted 2α . The length of the perforation segments 55 in the cross direction CD is noted β . Two consecutive tear lines 50 define the individual sheet length L in the rolls 4 (e.g., a length around 33 cm).

[0051] The short unperforated segments 56 of length 2α form attachment areas within the tear line 50 according to the cross-machine direction CD of the base sheet. The short unperforated segments form a plurality of attachment areas between two consecutive portions according to the machine direction MD of the base sheet. With an appropriately chosen length 2α , the resulting tensile strength of the tear lines 50 is significantly improved. This avoids, at least considerably reduces, the blowouts in the base sheet during production. Indeed, breaks in the base sheet cannot propagate, at least with difficulty, along the tear line 50. As a non-limitative example, the length 2α may be chosen around or superior to 8 mm (i.e. $\alpha \geq 4$ mm).

[0052] After the pinching step (S1), the perforated base sheet 1 is wound (step S2) onto a core 3 (or alternatively on itself for coreless log) in order to form a wound log 2 by means of the rewinding unit 11. Then, though not represented and similarly to the method for manufacturing a roll of sheet of absorbent material represented in FIG. 1, once the desired log diameter is reached:

[0053] the base sheet 1 is cut;

[0054] the produced log 2 is separated from the base sheet 1 and subsequently a new log begins to be produced;

[0055] a loose end forming a tail of the base sheet of the produced log 2 is adhered to the log; and

[0056] the produced log 2 is cut into multiple and individual rolls 4.

[0057] Considering the size of the individual roll, a width ratio of the edge regions relatively to the central region may range from about 4% (i.e. $2\alpha = 2 \times 4$ mm for a sheet width of the individual roll of 200 mm) to about 20% (i.e. $2\alpha = 2 \times 10$ mm for a sheet width of the individual roll of 100 mm).

[0058] FIG. 3 schematically and partially illustrates the method for manufacturing a log of sheet of absorbent material according to a second exemplary embodiment of the invention. The second exemplary embodiment differs from the first exemplary embodiment in that the base sheet 1 is pinched (step S1) with staggered tear lines 51 and 52 (schematically represented by dotted lines). One central region out of two in each tear line is replaced by an unperforated region, and two consecutive tear lines are staggered according to a cross-machine direction CD such that all the central region are positioned between two adjacent phantom lines. More precisely, two identical adjacent tear lines 50 in the first exemplary embodiment are replaced by a first tear line 51 adjacent to a second tear line 52, the first tear line 51 being staggered or offset according to the CD direction relatively to the second tear line 52. Further, the tear line 51 or 52 comprises alternating perforation segments 55 having a particular perforating pattern and long unperforated segments 56 (corresponding to two edge regions and one unperforated central region). The perforating pattern of the perforation segments 55 will be described in details in relation with FIGS. 7 to 11. The

perforated segments **55** are positioned in the middle of the full width defined by two adjacent phantom lines (e.g., **20** and **21** for the first tear line **51**), more precisely at a distance α from both phantom lines that defines the future edges of the individual roll. Still, the length of the perforation segments **55** in the cross direction CD is noted β . Compared to the first exemplary embodiment, in the second exemplary embodiment each long unperforated segment **56** has the length 2α increased from the length of a roll width, or a length $2\alpha + \beta + 2\alpha = 4\alpha + \beta$. Two consecutive tear lines **51** or **52** define the individual sheet length L in the rolls of sheet of absorbent material **4** (e.g., a length around 33 cm). Two adjacent tear lines **51** and **52** are separated by a distance 6 in the machine direction MD.

[0059] The long unperforated segments **56** of length $4\alpha + \beta$ form attachment areas within the tear line **51**, **52** according to the cross-machine direction CD of the base sheet. The long unperforated segments form a plurality of attachment areas between two consecutive portions according to the machine direction MD of the base sheet. Thus, the resulting tensile strength of the tear lines **51**, **52** is significantly improved. This avoids, at least considerably reduces, the blowouts in the base sheet during production. The breaks in the base sheet cannot propagate, at least with difficulty, along the tear line **51** or **52**. As a non-limitative example, the length 2α may be chosen around or superior to 8 mm (i.e. $\alpha \geq 4$ mm).

[0060] FIG. 4 is a perspective view schematically illustrating the individual roll of sheet of absorbent material **4** manufactured according to the first embodiment of FIG. 2 or the second embodiment of FIG. 3. The roll **4** may be a roll of paper, for example a roll of toilet paper or a roll of kitchen towels. The roll may comprise a core or may be coreless. The roll has evenly spaced-apart transverse tear lines **50**, **51**, **52** which extend across the width of individual sheet of absorbent material **59** (e.g., a paper web). The tear lines **50**, **51**, **52** enable tearing off and separation of individual sheets of paper **19** of a predetermined length L when the roll is unwound in the direction of the arrow. The two attachment areas between two consecutive individual sheets **19** (according to the machine direction MD of the sheet) resulting from the short unperforated segments of length a on each edge of the individual roll do not impair the separation of each individual sheet **19** from the roll **4** when the dimension α is appropriately chosen.

[0061] FIG. 5 is a perspective view schematically illustrating a perforating unit **10** used for pinching the base sheet **1** according to the manufacturing method of the first exemplary embodiment.

[0062] The perforating unit **10** comprises the perforator roll **11** and the anvil roll **12**. The space **18** is defined therebetween. The perforator roll **11** carries at least one knife, for example two knives **14**, **15**. In this non limitative example, the first knife **14** is positioned at 180 degrees relatively to the second knife **15**. More knives and different positioning angle are possible. The anvil roll **12** carries a spiral blade **13**. The perforator roll **11** and the anvil roll **12** are both rotating so that when the base sheet **1** is fed into the space **18**, it is pinched according to a scissors like movement between one of the knife **14** or **15** and the spiral blade **13**.

[0063] In the embodiment of FIG. 5, each knife **14**, **15** extends all along the width of the perforator roll **11**. This width corresponds at least to the width of the base sheet **1** or the width of the log **2**. Each knife is used to cut the tear line

50 (see FIG. 2) in the base sheet **1**. Each knife **14**, **15** comprises multiple zones **16**, each zone corresponding to a perforation segment **55** having a defined perforating pattern that may be chosen among the represented perforating pattern of FIGS. 7 to 11. Each zone **16** is separated from an adjacent zone by the distance 2α .

[0064] FIG. 6 is a perspective view schematically illustrating another perforating unit **10** used for pinching the base sheet **1** according to the manufacturing method of the second exemplary embodiment. The embodiment of FIG. 6 differs from the embodiment of FIG. 5 in that both knives **14** and **15** comprises segmented zones **16**. Similarly, each segmented zone **16** corresponds to a perforation segment **55** having a defined perforating pattern that may be chosen among the represented perforating pattern of FIGS. 7 to 11. The first knife **14** is used to cut the first tear line **51** (see FIG. 3) in the absorbent base sheet **1**. The second knife **15** is used to cut the second tear line **52** (see FIG. 3) in the absorbent base sheet **1**. A zone **16** of the first knife **14** is shifted relatively to a zone **16** of the second knife **15** by the distance 2α (corresponding to the two adjacent unperforated edge regions) so as to pinch the base sheet **1** according to staggered tear lines **51** and **52**.

[0065] FIG. 7 schematically illustrates a first exemplary perforating pattern of a perforation segment **55A** (top part) and the corresponding zone **16A** of the knife **14**, **15** (bottom part). The perforation segment **55A** comprises two perforated segments **60** separated by one unperforated segment **61**. The unperforated segment **61** forms an attachment area between two consecutive portions (according to the machine direction MD) of the base sheet. Each perforated segment **60** forms a detachment area between two consecutive portions (according to the machine direction MD) of the base sheet. The zone **16A** of the knife **14**, **15** comprises a succession of blade elements and notch corresponding to the first exemplary perforating pattern.

[0066] FIG. 8 schematically illustrates a second exemplary perforating pattern of a perforation segment **55B** (top part) and the corresponding zone **16B** of the knife **14**, **15** (bottom part). The perforation segment **55B** comprises four perforated segments **62**, two adjacent perforated segments **62** being separated by an unperforated segment **63**. The zone **16B** of the knife **14**, **15** comprises a succession of blade elements and notches corresponding to the second exemplary perforating pattern.

[0067] FIG. 9 schematically illustrates a third exemplary perforating pattern of a perforation segment **55C** (top part) and the corresponding zone **16C** of the knife **14**, **15** (bottom part). The perforation segment **55C** comprises eighteen perforated segments **64**, two adjacent perforated segments **64** being separated by an unperforated segment **65**. The zone **16C** of the knife **14**, **15** comprises a succession of blade elements and notches corresponding to the second exemplary perforating pattern.

[0068] FIG. 10 schematically illustrates a fourth exemplary perforating pattern of a perforation segment **55D** (top part) and the corresponding zone **16D** of the knife **14**, **15** (bottom part). The perforation segment **55D** comprises multiple perforated segments **66**, two adjacent perforated segments **66** being separated by an unperforated segment **67**. The width of the perforated segments **66** increases along the perforation segment **55D**, as depicted from the left to the right (or conversely). The width of the unperforated segment **67** is constant along the perforation segment **55D**. The zone

16D of the knife 14, 15 comprises a succession of blade elements and notches corresponding to the second exemplary perforating pattern. The width of the blade elements increases along the zone 16D of the knife while the width of the notch is constant.

[0069] FIG. 11 schematically illustrates a fifth exemplary perforating pattern of a perforation segment 55E (top part) and the corresponding zone 16E of the knife 14, 15 (bottom part). The perforation segment 55E comprises multiple perforated segments 68, two adjacent perforated segments 68 being separated by an unperforated segment 69. The width of the perforated segments 68 is constant along the perforation segment 55E. The width of the unperforated segment 69 increases along the perforation segment 55D, as depicted from the left to the right (or conversely). The zone 16E of the knife 14, 15 comprises a succession of blade elements and notches corresponding to the second exemplary perforating pattern. The width of the blade elements is constant along the zone 16D of the knife while the width of the notch increases.

[0070] In the represented perforating pattern of FIGS. 7 to 11, the numbers of perforated segments and unperforated segments are given as non-limitative examples, other numbers would also be satisfactory in the context of embodiments of the present invention.

[0071] The roll of sheet of absorbent product of an embodiment of the invention can be dispensed in various dispensers, for example in center-feed dispensers for dispensing sheets from the center of the roll or in tangential dispensers for tangentially dispensing sheets from the roll.

[0072] Tensile strength measurements according to the standard CEN 12625-4 (determination of tensile strength, stretch at break and tensile energy absorption of tissue paper and tissue products) have been performed on sheets according to the prior art and according to an embodiment of the invention. The characteristics of the central region comprising alternating perforated segments 60, 62, 64, 66, 68 of dimension and unperforated segments 61, 63, 65, 67, 69 of dimension US around 4 mm PS around 1 mm gives an unperforated ratio or bond ratio of 20% (1 mm over 5° mm). The perforating pattern is the one of FIG. 9.

Tensile Strength Measurements:

[0073]

	Prior Art $\alpha = 0$ mm	Invention $\alpha = 3$ mm	Invention $\alpha = 5.5$ mm	Invention $\alpha = 8$ mm
US = 1 mm PS = 4 mm	N/m	N/m	N/m	N/m
Single ply	64	56	63	71
Two plies	132	124	132	142

The log base sheet according to an embodiment of the invention can be converted at speeds typical in the industry, e.g., up to 650° m/min without the occurrence of sheet blowouts. This shows an improved tensile strength of each zone of weakness (tear line) of the log base sheet when runs into the converting machine. Further, the tensile strength of the sheet (e.g., wound as an individual roll) is similar, even less, to the one of the prior art, thus showing an easy dispensing. In particular, an edge region having a width (α) ranging from about 3 mm to about 5 mm gives excellent results in term of tensile strength, thus allowing easy dispensing. This is a surprising results because whatever the

size of the edge zone (within said range) and at equivalent unperforated ratio, the tensile strength of the tear line of the sheet is identical or at least quite similar, while one could have expected an increased tensile strength resulting in poor dispensing.

[0074] The drawings and their descriptions hereinbefore illustrate rather than limit the embodiments of the invention.

[0075] In the description and the drawings, each zone of weakness (being a tear line) have been described and/or shown as extending substantially transversally to the machine direction. This should be interpreted in a broad sense, meaning that the zone of weakness may be inclined relatively the cross-machine direction CD, as an example according to angle in a range of $\pm 10^\circ$.

[0076] The application of the absorbent sheet product is broad and encompasses numerous away-from-home, domestic or sanitary applications, e.g., towels, kitchen towels, hand towels, toilet papers, wipes, facial tissues, bath tissues, napkins etc.

[0077] Any reference sign in a claim should not be construed as limiting the claim. The word “comprising” does not exclude the presence of other elements than those listed in a claim. The word “a” or “an” or “at least one” preceding an element does not exclude the presence of a plurality of such element.

1. A sheet of absorbent material having opposite sheet side edges spaced apart from one another to define an overall width of the sheet of absorbent material, the sheet of absorbent material comprising zones of weakness spaced along the sheet of absorbent material according to a machine direction, each zone of weakness extending substantially transversally to said machine direction, each zone of weakness defining two adjacent individual absorbent sheet portions, each zone of weakness being a tear line,

wherein:

the tear line comprises two edge regions and a central region, a first edge region beginning at one of the sheet side edges towards the central region, a second edge region beginning at the other sheet side edges towards the central region, the central region comprising alternating perforated segments and unperforated segments, said edge regions are unperforated so as to constitute attachment areas within the tear line between two adjacent individual absorbent sheet portions.

2. The sheet of absorbent material of claim 1, wherein a width ratio of the edge regions relatively to the central region ranges from about 4% to about 20%

3. The sheet of absorbent material of claim 1, wherein an edge region width ranges from about 3 mm to about 10 mm.

4. The sheet of absorbent material according to claim 1, wherein the central region comprises alternating perforated segments and unperforated segments according to a perforation pattern comprising at least two perforated segments separated by one unperforated segment, each segment having substantially an identical width.

5. The sheet of absorbent material according to claim 1, wherein the central region comprises alternating perforated segments and unperforated segments according to a perforation pattern comprising multiple perforated segments, two adjacent perforated segments being separated by one unperforated segment, each perforated segment having a width increasing from one side edge towards the opposite side edge, each unperforated segment having a constant width.

6. The sheet of absorbent material according to claim 1, wherein the central region comprises alternating perforated segments and unperforated segments according to a perforation pattern comprising multiple perforated segments, two adjacent perforated segments being separated by one unperforated segment, each unperforated segment having a width increasing from one side edge towards the opposite side edge, each perforated segment having a constant width.

7. A roll of sheet of absorbent material comprising a sheet of absorbent material according to claim 1 wound onto a core or on itself.

8. An absorbent sheet product comprising the sheet of absorbent material according to claim 1, wherein the absorbent sheet is chosen among the group consisting of napkins, towels, kitchen towels, hand towels, toilet papers, wipes and facial tissues.

9. A log base sheet made of absorbent material having opposite log side edges spaced apart from one another to define an overall width of the log base sheet, the log base sheet comprising zones of weakness spaced along the log base sheet according to a machine direction of the log base sheet, each zone of weakness extending substantially transversally to said machine direction, each zone of weakness being a tear line, the log base sheet comprising multiple phantom lines parallel to the machine direction representing imaginary lines for cutting the log base sheet,

wherein:

the tear line comprises multiple successions of first edge region, a central region and a second edge region from one of the log side edge towards the other log side edge, the central region comprising alternating perforated segments and unperforated segments,

said edge regions are unperforated, and

each phantom line is positioned at a boundary between two adjacent edge regions so as to constitute attachment areas within said tear line between two adjacent central regions.

10. The log base sheet of claim 9, wherein a central region out of two in each tear line is replaced by an unperforated region, and wherein two consecutive tear lines are staggered

according to a cross-machine direction such that all the central region are positioned between two adjacent phantom lines.

11. A log of sheet of absorbent material comprising a log base sheet made of absorbent material according to claim 9 wound onto a core or on itself.

12. A method for manufacturing a roll of sheet of absorbent material comprising the steps of:

feeding a log base sheet made of absorbent material into a perforating unit, the log base sheet having opposite log side edges spaced apart from one another to define an overall width of the log base sheet;

defining zones of weakness spaced along the log base sheet according to a machine direction of the log base sheet, each zone of weakness extending substantially transversally to said machine direction, by pinching each zone of weakness as a tear line;

defining multiple phantom lines in the log base sheet parallel to the machine direction representing imaginary lines for cutting the log base sheet;

wounding the pinched log base sheet onto a core or on itself to form a log;

cutting the pinched log base sheet once a desired log diameter is reached;

cutting the log into multiple and individual rolls of absorbent material sheet; the manufacturing method is characterized in that it further comprises:

pinching each tear line as multiple successions of first edge region, a central region and a second edge region from one of the log side edge towards the other log side edge, the central region comprising alternating perforated segments and unperforated segments;

unperforating said edge regions; and

positioning each phantom line at a boundary between two adjacent edge regions so as to constitute attachment areas within said tear line between two adjacent central regions.

13. The manufacturing method of claim 12, wherein a central region out of two in a tear line is replaced by an unperforated region, and wherein two consecutive tear lines are staggered according to a cross-machine direction such that all the central region are positioned between two adjacent phantom lines.

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