Claims

1. A coreless roll of a tissue paper product, such as toilet paper or household towel, made of a spirally wound continuous web of tissue paper having a first end and a second end, the web of absorbent material being wound such as to define an axially extending inner hole centrally positioned relative to the coreless roll and such that the first end is located on the outer side of the coreless roll and the second end is located at the inner hole,

wherein the tissue paper product comprises at least two plies, at least one of the plies being an embossed ply with embossments, and all plies of the tissue paper product being made of Conventional Wet Press (CWP) paper,

wherein the coreless roll has an outer diameter in the range of from 95 to 150 mm, a diameter of the inner hole being in the range of from 20 to 50 mm, and the density of the coreless roll being in a range of 110 to 160 kg/m^3,

the tissue paper product comprising glued areas, where the plies are ply-bonded to each other using an adhesive such as a lamination glue, and non-glued areas between the glued areas,

wherein at least some of the glued areas are glued embossed areas that comprise embossments of the embossed ply,

wherein a sum of areas of all glued embossed areas is at least 6% of a sum of the areas of all glued areas and of areas of all non-glued areas, and

wherein, over at least 80% of the glued embossed areas, a maximum distance between adjacent embossments of the embossed ply is 2.5 mm or less, optionally 2.0 mm or less, or 1.5 mm or less.

2. The coreless roll of a tissue paper product of claim 1, wherein, over at least 80% of the glued embossed areas, an embossment density of at least 20 embossments/cm^2, optionally at least 40 embossments/cm^2,

wherein, optionally, at least 90%, optionally 95%, of the adhesive in the glued embossed areas is present where tips of embossments on the embossed ply are located,

wherein, optionally, the embossed ply comprises first embossments with a first embossment height and at least one further type of embossments with a height smaller than the first embossment height, and wherein optionally, at least 70%, or 80%, 90%, or 95%, of the adhesive in the glued embossed areas is present where tips of the first embossments are located.

3. The coreless roll of a tissue paper product of claim 1 or 2, wherein the sum of the areas of all glued embossed areas is at least 6% of a total area of the tissue paper product.

4. The coreless roll of a tissue paper product of any one of the preceding claims, wherein the glued embossed areas are arranged in a repetitive pattern, the repetitive pattern repeating a repeating unit in a direction of a length extension of the tissue paper product along the roll, a sample unit of the tissue paper product being a section with a minimum length in the direction of the length extension that comprises one repeating unit,

wherein the sum of the areas of all glued embossed areas is at least 6% of the sum of the areas of all glued areas and of all non-glued areas in the sample unit.

5. The coreless roll of a tissue paper product of any one of the preceding claims, wherein the glued embossed areas constitute at least 90%, optionally at least 95% or at least 98% of all glued areas,

wherein optionally all of the glued areas are glued

embossed areas.

6. The coreless roll of a tissue paper product of any one of the preceding claims, wherein at least 80%, optionally at least 80%, at least 85%, or at least 90%, or at least 95% of the embossments of the embossed ply are provided in the glued embossed areas.

7. The coreless roll of a tissue paper product of any one of the preceding claims, wherein at least 80%, optionally at least 90% or at least 95%, of the glued embossed areas comprise at least 25, optionally at least 30 embossments.

8. The coreless roll of a tissue paper product of any one of the preceding claims, wherein at least a part of an innermost circumvolution, optionally the entire innermost circumvolution, of the absorbent material of the coreless roll at the second end comprises a stabilizing coating composition.

9. The coreless roll of a tissue paper product of any one of the preceding claims,

wherein, over at least 80% of a sum of all surfaces of a repetitive unit of the tissue paper product, where the glued embossed areas are located, or of a sum of all surfaces of the tissue paper product, where the glued embossed areas are located, a maximum distance between adjacent embossments of the embossed ply is 2.5 mm or less, optionally 2.0 mm or less, or 1.5 mm or less.

10. The coreless roll of a tissue paper product of any one of the preceding claims,

wherein the tissue paper product comprises exactly two plies, a first ply and a second ply, wherein optionally the first ply is embossed and the second ply is embossed;

the density of the coreless roll lying in a range of

110 to 150 kg/m³,

wherein the sum of the areas of all glued embossed areas is at least 6%, optionally at least 7% or at least 8% or at least 9%, of the sum of the areas of all glued areas and of all non-glued areas,

a caliper of the tissue paper product optionally being at least 0.35 mm, optionally at least 0.40 mm or at least 0.45 mm, and

a grammage of the tissue paper product optionally being in a range of from 24 g/m^2 to 50 g/m^2, optionally 30 g/m^2 to 45 g/m^2.

11. The coreless roll of a tissue paper product of claim 10,

wherein the first ply comprises first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm,

wherein the adhesive, such as lamination glue, is optionally applied to tips of the first embossments of the first ply,

wherein the second ply comprises second embossments with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm,

wherein the first ply optionally comprises third embossments with a third height (h3) smaller than the first height (h1) (h1>h3), and

wherein the second ply optionally comprises fourth embossments with a fourth height (h4) smaller than the second height (h2) (h2>h4).

12. The coreless roll of a tissue paper product of any one of the claims 1 to 9,

wherein the tissue paper product comprises exactly three plies, the embossed ply being an outermost ply,

the density of the coreless roll lying in a range of 130 to 160 kg/m³,

wherein the sum of the areas of all glued embossed areas is at least 6%, optionally at least 7%, or at least

8% of the sum of the areas of all glued areas and of all non-glued areas, and

a caliper of the tissue paper product optionally being at least 0.40 mm, optionally at least 0.45 mm or at least 0.50 mm,

a grammage of the tissue paper product optionally being in a range of from 34 g/m^2 to 65 g/m^2, optionally 40 g/m^2 to 63 g/m^2, or 45 g/m^2 to 60 g/m^2.

13. The coreless roll of a tissue paper product of claim 12, the three plies being a first ply, a second ply, and a third ply, wherein the third ply is positioned between the first ply and the second ply,

wherein the first ply comprises first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm,

wherein the adhesive, such as lamination glue, is optionally applied to tips of the first embossments of the first ply,

wherein the second ply comprises second embossments with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm,

wherein the first ply optionally comprises third embossments with a third height (h3) smaller than the first height (h1) (h1>h3), and

wherein the second ply optionally comprises fourth embossments with a fourth height (h4) smaller than the second height (h2) (h2>h4).

14. The coreless roll of a tissue paper product of claim 12, wherein the third ply is unembossed.

15. The coreless roll of a tissue paper product of claim 13 or 14, wherein the first ply and the third ply have been embossed together to form the first embossments on the first ply and the third ply, and

wherein, optionally, the third embossments have been

formed only on the first ply but not on the third ply, or, wherein, optionally, the first ply and the third ply have been embossed together to form the third embossments on the first ply and the third ply.

16. The coreless roll of a tissue paper product of claim 13, wherein the third ply comprises fifth embossments with a fifth height (h5), the fifth height (h5) being in a range of 0.2 mm to 2.0 mm, and wherein the third ply has been embossed separately from the first ply and the second ply.

17. The coreless roll of a tissue paper product of any one of the claims 1 to 9,

wherein the tissue paper product comprises exactly four plies,

the density of the coreless roll lying in a range of 130 to 160 kg/m^3,

wherein the sum of the areas of all glued embossed areas is at least 6%, optionally at least 7%, or at least 8% of the sum of the areas of all glued areas and of all non-glued areas, and

a caliper of the tissue paper product optionally being at least 0.50 mm, optionally at least 0.55 mm.

18. The coreless roll of a tissue paper product of claim 17, the four plies being a first ply, a second ply, a third ply, and a fourth ply, wherein the first ply and the second ply are outermost plies of the tissue paper product,

wherein the first ply comprises first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm,

wherein the adhesive, such as lamination glue, is optionally applied to tips of the first embossments of the first ply,

wherein the second ply comprises second embossments

with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm,

wherein the first ply optionally comprises third embossments with a third height (h3) smaller than the first height (h1) (h1>h3), and

wherein the second ply optionally comprises fourth embossments with a fourth height (h4) smaller than the second height (h2) (h2>h4).

19. The coreless roll of a tissue paper product of claim 18, wherein the first ply and the third ply have been embossed together to form the first embossments on the first ply and the third ply,

wherein the fourth ply is unembossed or has been embossed separately from the first ply, the second ply, and the third ply, and

wherein the third embossments have optionally been formed only on the first ply but not on the third ply, or wherein the first ply and the third ply have been embossed together to form the third embossments on the first ply and the third ply.

20. The coreless roll of a tissue paper product of claim 18, wherein the first ply, the third ply, and the fourth ply have been embossed together to form the first embossments on the first ply, the third ply, and the fourth ply, and

wherein, optionally, the first ply, the third ply, and the fourth ply have been embossed together to form the third embossments on the first ply, the third ply, and the fourth ply, or

wherein, optionally, the third embossments have been formed on the first ply and the third ply, but not on the fourth ply, or

wherein, optionally, the third embossments have been formed on the first ply, but not on the third ply and the fourth ply.

21. The coreless roll of a tissue paper product of claim 18, wherein the third ply and the fourth ply have been embossed together separately from the first ply and the second ply, or

wherein one of the third ply and the fourth ply has been separately embossed from the first ply and the second ply, and the other one of the third ply and the fourth ply is unembossed, or

wherein the third ply and the fourth ply are unembossed.

22. The coreless roll of a tissue paper product of claim 18, wherein the first ply and the third ply have been embossed together to form the first embossments on the first ply and the third ply,

wherein the fourth ply and the second ply have been embossed together to form the second embossments on the fourth ply and the second ply, and

wherein, optionally, the first ply and the third ply have been embossed together to form the third embossments on the first ply and the third ply, or wherein the third embossments have been formed only on the first ply but not on the third ply.

23. The coreless roll of a tissue paper product of any one of the claims 1 to 9,

wherein the tissue paper product comprises exactly five or six plies,

the density of the coreless roll lying in a range of 150 to 160 kg/m^3,

wherein the sum of the areas of all glued areas is at least 6%, optionally at least 7%, or at least 8% of the sum of the areas of all glued areas and of all non-glued areas, and

a caliper of the tissue paper product optionally being at least 0.60 mm, optionally at least 0.65 mm.

24. The coreless roll of a tissue paper product of claim 23, wherein at least one of the outermost plies of the tissue paper product comprises first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm,

wherein the adhesive, such as lamination glue, is optionally applied to tips of the first embossments of the first ply,

wherein the other one of the outermost plies of the tissue paper product comprises second embossments with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm.

25. The coreless roll of a tissue paper product of any one of the preceding claims, wherein the coreless roll has a radial compression strength of 20 N or more, optionally of 25N or more, or of 30N or more.

26. A method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, comprising at least two plies, the method comprising the steps of:

- feeding at least two plies and embossing at least one of the at least two plies to form an embossed ply, wherein all of the fed plies are made of Conventional Wet Press (CWP) paper;
- ply-bonding the at least two plies using an adhesive, such as a lamination glue, forming glued areas and leaving non-glued areas between the glued areas, wherein at least some of the glued areas are glued embossed areas comprising embossments of the embossed ply, such that a sum of areas of all glued embossed areas is at least 6% of a sum of the areas of all glued areas and of areas of all non-glued areas, to form the tissue paper product;
- spirally winding up the tissue paper product on a mandrel to form a coreless roll and to define an axially

extending inner hole facing the mandrel, with a first end of the tissue paper product being located on the outer side of the coreless roll and the second end being located at the inner hole;

- withdrawing the mandrel, wherein the coreless roll comprises an outer diameter in the range of from 95 to 150 mm and a diameter of the inner hole is in the range of from 20 to 50 mm, and the density of the coreless roll lies in a range of 110 to 160 kg/m^3;

wherein the steps of embossing and of ply-bonding are performed such that, over at least 80% of the glued embossed areas, a maximum distance between adjacent embossments of the embossed ply is 2.5 mm or less, optionally 2.0 mm or less, or 1.5 mm or less.

27. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 26,

wherein the steps of embossing the at least one ply and of ply-bonding are performed such that, over at least 80% of the glued embossed areas, an embossment density of at least 20 embossments/cm^2, optionally at least 40 embossments/cm^2,

the method optionally comprising the step of providing at least 90%, optionally 95%, of the adhesive to tips of embossments of the embossed ply,

wherein the method optionally comprises embossing the at least one ply with first embossments with a first embossment height and at least one further type of embossments with a height smaller than the first embossment height, and comprises providing at least 90%, optionally 95%, of the adhesive of the adhesive to tips of the first embossments of the embossed ply in the tissue paper product.

28. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel,

of claim 26 or 27,

wherein the ply-bonding is performed to at least 80%, at least 85%, or at least 90, or at least 95% of all areas of the embossed ply which have been embossed.

29. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 26 to 28,

wherein the embossing to form the embossed ply comprises providing at least 25, optionally at least 30 embossments to at least 80%, at least 85%, or at least 90, or at least 95% of all areas to be embossed and ply-bonded.

30. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 26 to 29,

wherein the method comprises the step of coating at least a part of an innermost circumvolution, optionally the entire innermost circumvolution, of the absorbent material of the coreless roll at the second end with a stabilizing coating composition.

31. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 26 to 30, wherein the tissue paper product is manufactured to comprise exactly two plies, a first ply and a second ply, wherein the method optionally comprises embossing the first ply and the second ply,

the density of the coreless roll lying in a range of 110 to 150 kg/m^3,

wherein the sum of the areas of all glued embossed areas is at least 6%, optionally at least 7% or at least 8% or at least 9%, of the sum of the areas of all glued areas and of all non-glued areas,

a caliper of the tissue paper product optionally being at least 0.35 mm, optionally at least 0.40 mm or at

least 0.45 mm, and

a grammage of the tissue paper product optionally being in a range of from 24 g/m^2 to 50 g/m^2, optionally 30 g/m^2 to 45 g/m^2.

32. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 31, the method comprising the steps of:
- embossing the first ply to form first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm;
- optionally applying the adhesive, such as lamination glue, to tips of the first embossments of the first ply;
- embossing the second ply to form second embossments with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm;
- optionally, embossing the first ply to form third embossments with a third height (h3) smaller than the first height (h1) (h1>h3); and
- optionally, embossing the second ply to form fourth embossments with a fourth height (h3) smaller than the second height (h2) (h2>h4).

33. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 26 to 30, wherein the tissue paper product is manufactured to comprise exactly three plies, the embossed ply being an outermost ply,

the density of the coreless roll lying in a range of 130 to 160 kg/m^3,

wherein the sum of the areas of all glued embossed areas is at least 6%, optionally at least 7%, or at least 8% of the sum of the areas of all glued areas and of all non-glued areas, and

a caliper of the tissue paper product optionally being at least 0.40 mm, optionally at least 0.45 mm or at

least 0.50 mm,

a grammage of the tissue paper product optionally being in a range of from 34 g/m^2 to 65 g/m^2, optionally 40 g/m^2 to 63 g/m^2, or 45 g/m^2 to 60 g/m^2.

34. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 33, the three plies being a first ply, a second ply, and a third ply, wherein the third ply is positioned between the first ply and the second ply, the method comprising:
    - embossing the first ply to form first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm;
    - optionally applying the adhesive, such as lamination glue, to tips of the first embossments of the first ply;
    - embossing the second ply to form second embossments with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm;
    - optionally, embossing the first ply to form third embossments with a third height (h3) smaller than the first height (h1) (h1>h3); and
    - optionally, embossing the second ply to form fourth embossments with a fourth height (h3) smaller than the second height (h2) (h2>h4).

35. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 33 or 34,

the method not comprising a step of embossing the third ply.

36. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 33 to 35,

the method comprising the steps of:

- embossing the first ply and the third ply together to form the first embossments on the first ply and the third ply; and
- optionally, forming the third embossments only on the first ply but not on the third ply, or, optionally, embossing the first ply and the third ply together to form the third embossments on the first ply and the third ply.

37. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 33, 34, and 36, the method further comprising the step of:
- embossing the third ply of form fifth embossments with a fifth height (h5), the fifth height (h5) being in a range of 0.2 mm to 2.0 mm, wherein the third ply has been embossed separately from the first ply and the second ply.

38. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 26 to 30, wherein the tissue paper product is manufactured to comprise exactly four plies,

the density of the coreless roll lying in a range of 130 to 160 kg/m^3,

wherein the sum of the areas of all glued embossed areas is at least 6%, optionally at least 7%, or at least 8% of the sum of the areas of all glued areas and of all non-glued areas, and

a caliper of the tissue paper product optionally being at least 0.50 mm, optionally at least 0.55 mm.

39. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 38, the four plies being a first ply, a second ply, a third ply, and a fourth ply, wherein the first ply

and the second ply are outermost plies of the tissue paper product, the method comprising the steps of:

- embossing the first ply to form first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm;
- optionally applying the adhesive, such as lamination glue, to tips of the first embossments of the first ply;
- embossing the second ply to form second embossments with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm;
- optionally embossing the first ply to form third embossments with a third height (h3) smaller than the first height (h1) (h1>h3); and
- optionally embossing the second ply to form fourth embossments with a fourth height (h4) smaller than the second height (h2) (h2>h4).

40. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 39, the method comprising embossing the first ply and the third ply together to form the first embossments on the first ply and the third ply,

the method not comprising a step of embossing the fourth ply, or the method comprising a step of embossing the fourth ply separately from the first ply, the second ply, and the third ply, and

the method optionally comprising the step of forming the third embossments only on the first ply but not on the third ply, or of embossing the first ply and the third ply together to form the third embossments on the first ply and the third ply.

41. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 39, the method comprising the steps of:

- embossing the first ply, the third ply, and the

fourth ply together to form the first embossments on the first ply, the third ply, and the fourth ply;

- optionally, embossing the first ply, the third ply, and the fourth ply together to form the third embossments on the first ply, the third ply, and the fourth ply; or
- optionally, forming the third embossments on the first ply and the third ply, but not on the fourth ply; or
- optionally, forming the third embossments on the first ply, but not on the third ply and the fourth ply.

42. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 39, the method comprising the steps of:

- embossing the third ply and the fourth ply together separately from the first ply and the second ply; or
- embossing one of the third ply and the fourth ply separately from the first ply and the second ply, and not embossing the other one of the third ply and the fourth ply; or

neither embossing the third ply nor the fourth ply.

43. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 39, the method comprising the steps of:

- embossing the first ply and the third ply together to form the first embossments on the first ply and the third ply;
- embossing the fourth ply and the second ply together to form the second embossments on the fourth ply and the second ply; and
- optionally, embossing the first ply and the third ply together to form the third embossments on the first ply and the third ply, or forming the third embossments only on the first ply but not on the third ply.

44. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of any one of the claims 26 to 30, wherein the tissue paper product is manufactured to comprise exactly five or six plies,

the density of the coreless roll lying in a range of 150 to 160 kg/m³,

wherein the sum of the areas of all glued areas is at least 6%, optionally at least 7%, or at least 8% of the sum of the areas of all glued areas and of all non-glued areas, and

a caliper of the tissue paper product optionally being at least 0.60 mm, optionally at least 0.65 mm.

45. The method of manufacturing a coreless roll of a tissue paper product, such as toilet paper or household towel, of claim 44, the method comprising the steps of:
- embossing at least one of the outermost plies of the tissue paper product to form first embossments with a first height (h1), the first height (h1) being in a range of 0.2 mm to 2.0 mm;
- optionally applying the adhesive, such as lamination glue, to tips of the first embossments of the first ply;
- embossing the other one of the outermost plies of the tissue paper product to form second embossments with a second height (h2), the second height (h2) being in a range of 0.2 mm to 2.0 mm.

46. A coreless roll of a tissue paper product, such as toilet paper or household towel, made of a spirally wound continuous web of tissue paper having a first end and a second end, the web of absorbent material being wound such as to define an axially extending inner hole centrally positioned relative to the coreless roll and such that the first end is located on the outer side of the coreless roll and the second end is located at the

inner hole,

wherein the tissue paper product comprises at least two plies, the at least two plies including at least a first ply and a second ply, being the outermost plies of the tissue paper product, wherein all of the plies of the tissue paper product are made of Conventional Wet Press (CWP) paper,

wherein the coreless roll has an outer diameter in the range of from 95 to 150 mm, a diameter of the inner hole being in the range of from 20 to 50 mm, and the density of the coreless roll being in a range of 110 to 160 kg/m^3,

wherein the first ply is embossed with first embossments and the second ply is embossed with second embossments,

the tissue paper product comprising glued areas, where the plies are ply-bonded to each other using an adhesive, such as a lamination glue, and non-glued areas between the glued areas,

wherein at least some of the glued areas are glued embossed areas that comprise first embossments of the first ply and second embossments of the second ply,

wherein a sum of areas of all glued embossed areas is at least 6% of a sum of the areas of all glued areas and of areas of all non-glued areas.

47. The coreless roll of a tissue paper product of claim 46,

wherein, over at least 80% of the glued embossed areas, a maximum distance between adjacent embossments of the embossed ply is 2.5 mm or less, optionally 2.0 mm or less, or 1.5 mm or less.