CLAIMS

1. An apparatus for producing meltblown fibres (MF) and comprising a die head (104) with several spinning orifices, means (100, 101,102, 103) for extruding at least one melted polymeric material through the spinning orifices of the die head (104) in the form of meltblown filaments (f), and means (104a, 104b) for blowing a hot primary gas flow (F1) towards the outlet of the die head (104) in order to draw and attenuate the polymeric filaments (f) at the outlet of the die head, and a drawing unit (105) positioned below the die head (104), and adapted to create an additional gas flow (F3) that is oriented downstream for further drawing and attenuating the meltblown filaments (f).
2. The apparatus of claim 1, wherein the drawing unit (105) is adapted to break the meltblown filaments (f) into discontinuous meltblown fibres (MF).
3. The apparatus of claim 2, wherein the drawing unit (105) is adapted to break the meltblown filaments (f) into discontinuous meltblown fibres (MF) having an average length higher than 20mm, preferably higher than 40mm and preferably not more than 250mm.
4. The apparatus of any one of claims 1 to 3, wherein the drawing unit (105) comprises a channel (1050) that is positioned below the die head (104), in such a way that the meltblown filaments (f) delivered by the die head (104) can pass through the channel, and air blowing means (1051-1055) adapted to blow the said additional gas flow (F3) inside the channel (1050).
5. The apparatus of claim 4, wherein the drawing unit (105) is adapted to create above the drawing unit a sucked air flow (F4) that enters into the channel (1050).
6. The apparatus of any one of the previous claims, wherein the distance (d) between the outlet of the die head (104) and the inlet (1050a) of the drawing unit (105) is adjustable.

7. The apparatus of any one of the previous claims, wherein whole or part of the spinning orifices of the die head (104) are multilobal, and more particularly bilobal or trilobal.

8. The apparatus of any one of the previous claims, further comprising a movable surface (11) positioned below the drawing unit (105) and adapted to form a meltblown nonwoven web (MBW) from the meltblown fibres (MF) delivered by the drawing unit (105).

9. The apparatus of any one of the previous claims, further comprising supplying means (13) for continuously feeding a stream of fibrous material (FM) at a position between the die head (104) and the drawing unit (105), and nearby the meltblown filaments (f).

10. The apparatus of any one of the previous claims wherein the die head (104) is adapted to extrude vertical filaments, and the additional gas flow (F3) is oriented downwardly.

11. A process comprising the following steps :

(i) extruding through spinning orifices of a die head (104) at least one melted polymeric material in order to form polymeric meltblown filaments (f),

(ii) drawing and attenuating the meltblown filaments at the outlet of the die head (104), by means of a hot primary gas flow (F1),

(iii) using a drawing unit (105) positioned below the died head (104) for generating an additional gas flow (F3) that is oriented downstream, in order to further draw and attenuate the meltblown filaments (f).

12. The process of claim 11, wherein step (iii) is performed in such a way to break the meltblown filaments (f) into discontinuous meltblown fibres (MF).

13. The process of claim 12, wherein step (iii) is performed in such a way to break the meltblown filaments (f) into discontinuous meltblown fibres having an average length higher than 20mm, and preferably higher than 40mm.

~~14. The process of claim 12 or 13, wherein step (iii) is performed in such a way to break the meltblown filaments (f) into discontinuous meltblown fibres having an average length of not more than 250mm, and preferably of not more than 150mm.~~

~~15. The process of any one of claims 11 to 14, wherein step (iii) is performed in such a way to break the meltblown filaments (f) into discontinuous meltblown fibres having an average diameter less than 10µm, and preferably less than 2µm.~~

~~16. The process of any one of claims 11 to 14, wherein step (iii) is performed in such a way to break the meltblown filaments (f) into discontinuous meltblown fibres having an average diameter between 10µm and 400µm.~~

~~17. The process of any one of claims 11 to 16, wherein the meltblown fibres (MF) are delivered onto a moving surface (11a) in order to form a meltblown nonwoven web (MWB).~~

~~18. The process of any one of claims 11 to 17, wherein fibrous material (MF) is continuously fed at a position between the die head (104) and the drawing unit (105), and nearby the meltblown filaments (f).~~

~~19. The process of any one of claims 11 to 18, wherein the shape in cross-section of the meltblown fibres (MF) is not circular.~~

~~20. The process of any one of claims 11 to 18, wherein the shape in cross-section of the meltblown fibres (MF) is multilobal, and preferably bilobal or trilobal.~~

~~21. The process of any one of claims 11 to 20, wherein the melt flow index of the polymer is between 15 and 70.~~

~~22. The process of any one of claims 11 to 21, wherein the filaments remain straight in the drawing unit and do not have any flapping movement.~~

~~23~~1. An apparatus for making a fibrous-containing nonwoven, said apparatus comprising a die head ~~(104, 104')~~ with several spinning orifices, means for extruding at least one melted polymeric material

through the spinning orifices of the die head in the form of filaments ~~(f)~~, and a drawing unit ~~(105)~~ positioned below the die head, and adapted to create a gas flow ~~(F3)~~ that is oriented downstream for drawing and attenuating the filaments ~~(f)~~, the apparatus further comprising supplying means ~~(13, 13')~~ for continuously feeding a stream of fibrous material ~~(FM)~~ at a position between the die head ~~(104, 104')~~ and the drawing unit ~~(105)~~, and nearby the filaments ~~(f)~~.

~~24~~2. The apparatus of claim ~~23~~1, wherein the die head does not comprise blowing mean for blowing a hot primary gas flow ~~(F1)~~ towards the outlet of the die head ~~(104)~~.

~~25~~3. The apparatus of claim ~~23~~1 or ~~24~~2, further comprising cooling means ~~(106)~~ for blowing a quenching air ~~(F6)~~ towards the filaments ~~(f)~~ at a position between the die head ~~(104')~~ and the supplying means ~~(13')~~.

~~26~~4. The apparatus of claim ~~23~~1, further comprising means ~~(104a, 104b)~~ for blowing a hot primary gas flow ~~(F1)~~ towards the outlet of the die head ~~(104)~~.

~~27~~5. The apparatus of any one of claims ~~23~~1 to ~~26~~4, wherein the drawing unit ~~(105)~~ is adapted to break the filaments ~~(f)~~ into discontinuous fibres ~~(MF)~~.

~~28~~6. The apparatus of claim ~~27~~5, wherein the drawing unit ~~(105)~~ is adapted to break the filaments ~~(f)~~ into discontinuous fibres ~~(MF)~~ having an average length higher than 20mm, preferably higher than 40mm.

~~29~~7. The apparatus of claim ~~27~~5 or ~~28~~6, wherein the drawing unit ~~(105)~~ is adapted to break the filaments ~~(f)~~ into discontinuous fibres ~~(MF)~~ having an average length of not more than 250mm, and preferably of not more than 150mm.

~~30~~8. The apparatus of any one of claims ~~23~~1 to ~~29~~7, wherein the drawing unit ~~(105)~~ comprises a channel ~~(1050)~~ that is positioned below the die head ~~(104, 104')~~, in such a way that the filaments ~~(f)~~ delivered

by the die head ~~(104, 104')~~ can pass through the channel, and air blowing means ~~(1051–1055)~~ adapted to blow the said additional gas flow ~~(F3)~~ inside the channel ~~(1050)~~.

~~3~~19. The apparatus of claim ~~3~~08, wherein the drawing unit ~~(105)~~ is adapted to create above the drawing unit a sucked air flow ~~(F4)~~ that enters into the channel ~~(1050)~~.

~~32~~10. The apparatus of any one of claims ~~23~~1 to ~~3~~19, wherein the distance ~~(d)~~ between the outlet of the die head ~~(104, 104')~~ and the inlet ~~(1050a)~~ of the drawing unit ~~(105)~~ is adjustable.

~~33~~11. The apparatus of any one of claims ~~23~~1 to ~~32~~10, wherein whole or part of the spinning orifices of the die head ~~(104, 104')~~ are non circular orifices.

~~34~~12. The apparatus of ~~of~~ any one of claims ~~23~~1 to ~~32~~10, wherein whole or part of the spinning orifices of the die head ~~(104, 104')~~ are multilobal, and more particularly bilobal or trilobal.

~~35~~13. The apparatus of any one of claims ~~23~~1 to ~~34~~12, further comprising a movable surface ~~(11)~~ positioned below the drawing unit ~~(105)~~ and adapted to form a nonwoven web from the fibres delivered by the drawing unit ~~(105)~~.

~~36~~14. The apparatus of any one of claims ~~23~~1 to ~~35~~13, wherein the die head ~~(104)~~ is adapted to extrude vertical filaments, and the additional gas flow ~~(F3)~~ is oriented downwardly.

15. The apparatus of any one of claims 1 to 14, further comprising a thermal bonding unit for thermo-bonding the fibrous material.

16. The apparatus of any one of claim 1 to 15 wherein the supplying means comprises a conveyor belt for continuously delivering the fibrous material.

~~37~~17. A process for making a fibrous-containing nonwoven, wherein:

(i) at least one melted polymeric material is extruded through spinning orifices of a die head ~~(104, 104')~~ in order to form polymeric filaments ~~(f)~~,

(ii) a drawing unit ~~(105)~~ positioned below the died head ~~(104, 104')~~ is used for generating a gas flow ~~(F3)~~ that is oriented downstream, in order to draw and attenuate the filaments ~~(f)~~.

(iii) fibrous material ~~(MF)~~ is continuously fed at a position between the die head ~~(104, 104')~~ and the drawing unit ~~(105)~~, and nearby

the filaments ~~(f)~~.

~~38~~18. The process of claim ~~37~~17, wherein the filaments at the outlet of the die head ~~(104)~~ are drawn and attenuated by means of a hot primary gas flow ~~(F1)~~.

~~39~~19. The process of claim ~~37~~17, wherein the filaments are not drawn at the outlet of the die head ~~(104)~~.

~~40~~20. The process of claim ~~37~~17 or ~~39~~19, wherein the filaments are cooled down by a forced airflow ~~(F6)~~ below the die head ~~(104')~~ and prior to the feeding of the fibrous material ~~(MF)~~.

~~41~~21. The process of any one of claims ~~37~~17 to ~~40~~20, wherein step (ii) is performed in such a way to break the filaments ~~(f)~~ into discontinuous fibres ~~(MF)~~.

~~42~~22. The process of any one of claims ~~37~~17 to ~~40~~20, wherein step (ii) is performed in such a way to break the filaments ~~(f)~~ into discontinuous fibres having an average length higher than 20mm, preferably higher than 40mm.

~~43~~23. The process of any one of claims ~~37~~17 to ~~42~~22, wherein step (ii) is performed in such a way to break the filaments ~~(f)~~ into discontinuous fibres having an average length of not more than 250mm, and preferably of not more than 150mm.

~~44~~24. The process of any one of claims ~~37~~17 to ~~43~~23, wherein step (ii) is performed in such a way to break the filaments ~~(f)~~ into discontinuous fibres having an average diameter less than 10µm, and preferably less than 2µm.

~~45~~25. The process of any one of claims ~~37~~17 to ~~43~~23, wherein step (iii) is performed in such a way to break the filaments ~~(f)~~ into discontinuous fibres having an average diameter between 10µm and 400µm.

~~46~~26. The process of any one of claims ~~37~~17 to ~~45~~25, wherein the fibres ~~(MF)~~ are delivered onto a moving surface ~~(11a)~~ in order to form a nonwoven web ~~(MWB)~~.

~~47~~27. The process of any one of claims ~~37~~17 to ~~46~~26, wherein the shape in cross-section of the fibres ~~(MF)~~ is not circular.

~~48~~28. The process of any one of claims ~~37~~17 to ~~46~~26, wherein the shape in cross-section of the fibres ~~(MF)~~ is multilobal, and preferably bilobal or trilobal.

~~49~~29. The process of any one of claims ~~37~~17 to ~~48~~28, wherein the melt flow index of the polymer is between 15 and 70.

~~50~~30. The process of any one of claims ~~37~~17 to ~~49~~29, wherein the filaments remain straight in the drawing unit and do not have any flapping movement.

31. The process of any one of claims 17 to 30, wherein the fibrous-containing nonwoven is thermo-bonded.

32. The process of any one of claims 17 to 31, wherein the fibrous material is continuously fed nearby the filaments by a conveyor belt.

~~51. An apparatus for producing fibres (MF) and comprising a die head (104) with several spinning orifices, means (100, 101, 102, 103) for extruding at least one melted polymeric material through the spinning orifices of the die head (104) in the form of filaments (f), and a drawing unit (105) positioned below the die head (104), and adapted to create a gas flow (F3) that is oriented downstream for drawing and attenuating the filaments (f), and wherein the drawing unit (105) is adapted to break the filaments (f) into discontinuous fibres (MF).~~

~~52. The apparatus of claim 51, wherein the drawing unit (105) is adapted to break the filaments (f) into discontinuous fibres (MF) having an average length of not more than 250mm, and preferably of not more than 150mm.~~

~~53. The apparatus of claim 51 or 52, wherein the drawing unit (105) is adapted to break the filaments (f) into discontinuous fibres (MF) having an average length higher than 20mm, and preferably higher than 40mm.~~

~~54. The apparatus of any one of claims 51 to 53, further comprising supplying means (13) for continuously feeding a stream of fibrous material (FM) at a position between the die head (104) and the drawing unit (105), and nearby the filaments (f).~~

55. The apparatus of any one of claims 51 to 54, further comprising cooling means (106) for blowing a quenching air (F6) towards the filaments (f) at a position between the die head (104') and the drawing unit (105).

56. The apparatus of any one of claims 51 to 54, further comprising means (104a, 104b) for blowing a hot primary gas flow (F1) towards the outlet of the die head (104).

57. The apparatus of any one of claims 51 to 56, wherein the drawing unit (105) comprises a channel (1050) that is positioned below the die head (104, 104'), in such a way that the filaments (f) delivered by the die head (104, 104') can pass through the channel, and air blowing means (1051-1055) adapted to blow the said additional gas flow (F3) inside the channel (1050).

58. The apparatus of claim 57, wherein the drawing unit (105) is adapted to create above the drawing unit a sucked air flow (F4) that enters into the channel (1050).

59. The apparatus of any one of claims 51 to 58, wherein the distance (d) between the outlet of the die head (104, 104') and the inlet (1050a) of the drawing unit (105) is adjustable.

60. The apparatus of any one of claims 51 to 59, wherein whole or part of the spinning orifices of the die head (104, 104') are non circular orifices

61. The apparatus of any one of claims 51 to 59, wherein whole or part of the spinning orifices of the die head (104, 104') are multilobal, and more particularly bilobal or trilobal.

62. The apparatus of any one of claims 51 to 61 , further comprising a movable surface (11) positioned below the drawing unit (105) and adapted to form a nonwoven web from the fibres delivered by the drawing unit (105).

63. The apparatus of any one of claims 51 to 62, wherein the die head is adapted to extrude vertical filaments, and the additional gas flow

(F3) is oriented downwardly.

64. A process for producing fibres (MF) wherein :

(i) at least one melted polymeric material is extruded through spinning orifices of a die head (104, 104') in order to form polymeric filaments (f),

(ii) a drawing unit (105) positioned below the died head (104, 104') is used for generating a gas flow (F3) that is oriented downstream, in order to draw and attenuate the filaments (f), and in such a way to break the filaments (f) into discontinuous fibres (MF).

65. The process of claims 64, wherein step (ii) is performed in such a way to break the filaments (f) into discontinuous fibres having an average length of not more than 250mm, and preferably of not more than 150mm.

66. The process of any claim 64 or 65 wherein step (ii) is performed in such a way to break the filaments (f) into discontinuous fibres having an average length higher than 20mm, preferably higher than 40mm.

67. The process of any one of claims 64 to 66, wherein step (ii) is performed in such a way to break the filaments (f) into discontinuous fibres having an average diameter less than 10µm, and preferably less than 2µm.

68. The process of any one of claims 64 to 66, wherein step (iii) is performed in such a way to break the filaments (f) into discontinuous fibres having an average diameter between 10µm and 400µm.

69. The process of any one of claims 64 to 68, wherein the filaments at the outlet of the die head (104) are drawn and attenuated by means of a hot primary gas flow (F1).

70. The process of any one of claims 64 to 68, wherein the filaments are cooled down by a forced airflow (F6) below the die head (104').

71. The process of any one of claims 64 to 70, wherein fibrous material (MF) is continuously fed at a position between the die head (104, 104') and the drawing unit (105), and nearby the filaments (f).

72. The process of any one of claims 64 to 71 , wherein the fibres (MF) are delivered onto a moving surface (11a) in order to form a nonwoven web (MWB).

73. The process of any one of claims 64 to 72, wherein the shape in cross-section of the fibres (MF) is not circular.

74. The process of any one of claims 64 to 73, wherein the shape in cross-section of the fibres (MF) is multilobal, and preferably bilobal or trilobal.

75. The process of any one of claims 64 to 74, wherein the melt flow index of the polymer is between 15 and 70.

76. The process of any one of claims 64 to 75, wherein the filaments remain straight in the drawing unit and do not have any flapping movement.

77. A nonwoven comprising at least one layer (MBW) of non-staple fibres (MF) having a shaped cross-section and having an average length of not more than 250mm, and preferably of not more than 150mm.

78. The nonwoven of claim 77 wherein the shape in cross section of the non-staple fibres is multilobal.

79. The nonwoven of claim 77 wherein the shape in cross section of the non-staple fibres is bilobal

80. The nonwoven of any one of claims 77 to 78 wherein the average length of the non-staple fibres (MF) is higher than 20mm, and preferably higher than 40mm.

81. The nonwoven of any one of claims 77 to 80 wherein the average diameter of the non-staple fibres is less than 10µm, and preferably less than 2µm.

82. The nonwoven of any one of claims 77 to 81 wherein the average

~~diameter of the non-staple fibres is between 10µm and 400µm.~~

~~83. The nonwoven of any one of claims 77 to 82, wherein the non-staple fibres (MF) are not crimped.~~

~~84. The nonwoven of any one of claims 77 to 83, wherein said nostaple fibres (MF) are meltblown fibres.~~

~~85. The nonwoven of any one of claims 77 to 83, wherein the said at least one layer (MBW) of non-staple fibres also comprises fibrous material (FM) intermingled with the non-staple fibres (MF).~~

~~86. Use of a nonwoven of any one of claims 77 to 85 or of a nonwoven issued from the process of any one of claims 11 to 22, or issued from the process of any one of claim 37 to 50 or issued from the process of any one of claims 64 to 76, for making absorbent products, and more particularly dry or wet wipes, diapers, training pants, sanitary napkins, incontinence products, bed pads.~~