fibrous material is even more important and detrimental in case the fibrous-containing meltblown nonwoven is submitted to a subsequent hydro-entanglement step, as described in aforesaid US patent No 4,931, 355 and US patent No 4,939,016.

Summary of the invention

~~A first objective of the invention is to propose a novel improved technical solution for spinning meltblown fibres.~~

~~This first objective is achieved by the meltblow apparatus of claim 1 and by the meltblow process of claim 11.~~

There is disclosed an apparatus for producing meltblown fibres, the apparatus comprise~~s~~ing a die head 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 meltblown filaments, and means for blowing a hot primary gas flow towards the outlet of the die head in order to draw and attenuate the polymeric filaments at the outlet of the die head, and a drawing unit positioned below the die head, and adapted to create an additional gas flow that is oriented downstream for further drawing and attenuating the meltblown filaments.

There is also disclosed a process, the process comprise~~s~~ing the following steps :

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

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

(iii) using a drawing unit positioned below the died head for generating an additional gas flow that is oriented downstream, in order to further draw and attenuate the meltblown filaments. ~~A second objective of the invention is to propose a novel improved technical solution for making a fibrous-containing nonwoven, said novel improved technical solution notably overcoming the aforesaid drawbacks of the solution discloses in US patent No 4,931, 355 and in US patent No 4,939,016 to Radwanski et~~

~~al.~~

~~This second objective is achieved by the spinning apparatus of claim 23 and by the spinning process of claim 37.~~

According to a first aspect of the present invention, there is provided an~~The spinning~~ apparatus for making a fibrous-containing nonwoven, comprises a die head 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, and a drawing unit positioned below the die head, and adapted to create a gas flow that is oriented downstream for drawing and attenuating the filaments, the apparatus further comprising supplying means for continuously feeding a stream of fibrous material at a position between the die head and the drawing unit, and nearby the filaments.

According to a second aspect of the present invention, there is provided a~~The spinning~~ process for making a fibrous-containing nonwoven, wherein ~~comprises the following operations~~:

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

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

(iii) fibrous material is continuously fed at a position between the die head, and the drawing unit, and nearby the filaments.

~~A third objective of the invention is to propose a novel improved technical solution for spinning discontinuous fibres.~~

~~This third objective is achieved by the apparatus of claim 51 and by the process of claim 64.~~

There is further disclosed an apparatus for spinning discontinuous fibres, the apparatus comprise~~s~~ing a die head 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, and a

drawing unit positioned below the die head, and adapted to create a gas flow (F3) that is oriented downstream for drawing and attenuating the filaments (f), and for breaking the filaments

into discontinuous fibres.

In the process for producing discontinuous fibres (MF) :

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

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

The word "fibres" as used therein and in the claims encompasses long continuous fibres (also commonly referred as "filaments") and shorter discontinuous fibres.

The word "downstream" used therein and in the claims means that the gas flow is oriented substantially in the direction of the polymer flow.

There~~Another object of the invention~~ is also disclosed a nonwoven comprising at least one layer of non-staple fibres having a shaped cross-section and having an average length of not more than 250mm.

More particularly, the said layer also comprises fibrous material intermingled with the non-staple fibres.

The fibrous material can advantageously comprise absorbent pulp fibres.

The wording "non-staple fibres" used therein and in the claims defines discontinuous fibres that have been obtained by stretching polymeric filaments in such a way to break the filaments during their extrusion, in contrast with so-called "staple fibres" which are obtained by mechanically cutting filaments after their extrusion process notably by using cutting blades.

Staple fibres have generally the same length and are previously crimped before cutting. In contrast, the non-staple fibres have different lengths due to their random breaking during their extrusion and are generally not crimped.

The wording "shaped fibres" or "shaped cross section" used therein and in the claims means fibres having a cross section that is not circular.

There is also disclosed a~~Another object of the invention is the~~ use of such a nonwoven for making absorbent products, and more particularly dry or wet wipes, diapers, training pants, sanitary napkins, incontinence products, bed pads.

Brief description of the drawings

Other characteristics and advantages of the invention will appear more clearly on reading the following description of preferred embodiments of the invention, which description is given by way of non-limiting example and is made with reference to the accompanying drawings, in which:

- Figure 1 is a schematic representation of an apparatus according to a first embodiment of the invention, and adapted to produce a novel fibrous-containing meltblown nonwoven,
- Figure 2 is a detailed view in cross-section of an example of air-drawing unit that can be used in the apparatus of figure 1,
- Figure 3 is a view in cross-section of a bilobal meltblown fibre,
- Figure 4 is view in cross-section of a trilobal meltblown fibre,
- Figures 5A to 5C are a schematic representation of a production line adapted to produce a laminate comprising several meltblown nonwoven of the invention,
- Figure 6 is a schematic representation of an apparatus according to a second embodiment of the invention, and adapted to produce a fibrous-containing nonwoven.

Detailed description

In reference to figure 1, the apparatus 1 comprises a meltblow equipment 10 for spinning polymeric meltblown fibres MF and a conveyor belt 11 for catching the meltblown fibres MF issued from the meltblow unit 10. This conveyor belt 11 is air permeable and is knowingly associated with a suction device 12 for sucking the meltblown fibres MF onto a