CLAIMS

1. An apparatus for producing a filter element having a filter forming module, comprising: -

- a first forming guide configured to receive a continuous strand of a primary filter material;
- a frontend cutting unit positioned downstream of the first forming guide, wherein the frontend cutting unit is operable to cut the primary filter material exiting from the first forming guide into a plurality of filter strand segments, each filter strand segment having a pre-determined length;
- a forming element positioned downstream of the frontend cutting unit, and configured to compress the primary filter material or the plurality of filter strand segments to form a filter body of a pre-determined shape and/or a pre-determined dimension; and
- a heating unit placed along a pathway of the continuous strand of the primary filter material and at an inlet side of the filter forming module, wherein the heating unit is configured to switch between two or more operational modes based on a property of the primary filter material.

2. The apparatus according to claim 1, wherein the two or more operational modes of the heating unit comprise: at least one heating mode whereby the heating unit is operable to heat the primary filter material at a pre-determined heating temperature or a pre-determined heating profile according to a property of the primary filter material, and a non-heating mode whereby the heating unit is powered off.

3. The apparatus according to claim 2, wherein the pre-determined heating temperature used for the at least one heating mode is a glass transition temperature of the primary filter material.

4. The apparatus according to any one of the preceding claims, further comprising a conveyor device and a positioning device, wherein the conveyor device is configured to move the plurality of filter strand segments to the forming unit, and the positioning

device is configured to separate two adjacent filter strand segments by a gap of a pre-determined length along a pathway of the plurality of filter strand segments.

5. The apparatus according to any one of the preceding claims, further comprising:

- a wrapping unit configured to provide a wrapping material around at least a portion of the primary filter material exiting from the first forming guide, and direct the primary filter material and the wrapping material to the forming element.

6. The apparatus according to claim 5, wherein the wrapping unit comprises:

- a wrapping material source arranged to provide the wrapping material to an infeed forming area at an inlet side of the forming unit; and
- a sealing device arranged to secure edges of the wrapping material around the primary filter material, such that an overwrap is formed circumscribing the surface of the filter body.

7. The apparatus according to any one of the preceding claims, further comprising:-

- a backend cutting unit arranged at an outlet side of the filter forming module, and configured to cut the filter body into a pre-determined length and/or at pre-determined locations.

8. The apparatus according to any one of the preceding claims, wherein the filter forming module comprises a second forming guide positioned downstream of the first forming guide and at an inlet side of the first forming element, wherein the second forming guide is configured to receive and gather a secondary filter material and the primary filter material from the first forming guide.

9. The apparatus according to claim 8, further comprising a steam chamber positioned adjacent the second forming guide for containing at least a portion of the secondary filter material and at least a portion of the primary filter material, wherein

- a steam generator is arranged to provide a desired humidity inside the steam chamber, and

- a sprayer is configured to direct a mist of a chemical solution for forming a hardened layer of the second filter material on the surface of the primary filter material.

10. The apparatus according to claim 8 or 9, wherein the secondary filter material comprises a fibrous tow material.

11. The apparatus according to any one of the preceding claims, wherein the primary filter material is formed from at least one of a net material, a filler material, and a combination of a net material and a filler material.

12. The apparatus according claim 11, wherein the net material comprises a plastic netting formed using an extrusion process, or an open-mesh fabric material formed using a weaving, knitting, and/or braiding process.

13. The apparatus according to any one of the preceding claims, wherein the primary filter material comprises a natural material obtained from one or more of the following plant parts: - leaf, bark, trunk, fruit, seed, stem, flower, pollen, branch, root, sap, pulp, resin bagasse, calyx of the respective flora.

14. The apparatus according to any one of the preceding claims, wherein the filter forming module is connected to a filter material supply module, the filter material supply module comprises:

- at least one material bobbin loaded with the primary filter material; and
- an unwinder operable to unwind and transfer the primary filter material from the material bobbin towards the filter forming module at a pre-determined speed.

15. The apparatus according to claim 14, wherein the filter material supply module further comprises at least one stock bobbin configured to supply the primary filter material to at least one of the following: the at least one material bobbin, the filter forming module.

16. The apparatus according to any one of the preceding claims, wherein the filter forming module is connected to an inner channel formation module, the inner channel formation module is configured to receive the filter material and to form a filter body with an internal profile.

17. The apparatus according to any one of the preceding claims, wherein the filter forming module is connected to an inner filter component supply module, the inner filter component supply module is configured to contain one or more pre-formed inner filter components and to supply the one or more pre-formed inner filter components to the filter forming module at a pre-determined speed.

18. The apparatus according to claim 17, wherein the inner filter component supply module is further configured to separate each two adjacent pre-formed inner filter components by a gap of a pre-determined length.

19. A method of forming a filter element, comprising the steps of:

- receiving a continuous strand of a primary filter material at an inlet side of a filter forming module;
- passing the primary filter material through a heating unit placed along a pathway of the continuous strand of the primary filter material and at an inlet side of the filter forming module, whereby the heating unit is configured to switch between two or more operational modes based on a property of the primary filter material; and
- passing the continuous strand of the primary filter material through a frontend cutting unit, whereby the frontend cutting unit is operable to cut the primary filter material exiting from the first forming guide into a plurality of filter strand segments, each filter strand segments having a pre-determined length;
- compressing the primary filter material or the plurality of filter strand segments to form a filter body of a pre-determined shape and/or a pre-determined dimension.

20. The method according to claim 19, wherein the two or more operational modes of the heating unit comprise at least one heating mode whereby the heating unit is operable

to heat the primary filter material at a pre-determined heating temperature or a pre-determined heating profile according to a property of the primary filter material, and a non-heating mode whereby the heating unit is powered off.

21. The method according to any one of claims 19 to 20, further comprising the step of

- separating each two adjacent filter strand segments by a gap of a pre-determined length.

22. The method according to any one of claims 19 to 21, further comprising the steps of

- providing a wrapping material before the step of compressing the primary filter material into the filter body; and
- sealing edges of the wrapping material such that the wrapping material circumscribes at least a portion of the primary filter material.

23. The method according to any one of claims 19 to 22, comprising the steps of

- providing a secondary filter material before the step of compressing the primary filter material into a filter body; and
- forming a layer of the second filter material around the primary filter material.

24. The method according to claim 23, further comprising a step of treating the secondary filter material with a hardening solution.

25. The method according to any one of claims 19 to 24, further comprising a step of cutting the filter body into a plurality of portions.

26. The method according to any one of claims 20 to 25, comprising a step of heating the primary filter material at a glass transition temperature of the primary filter material, according to the at least one heating mode.

27. The method according to any one of claims 19 to 26, further comprising a step of transferring a continuous strand of a net filter material from a material supply module to the inlet side of the filter forming module.

28. The method according to any one of claims 19 to 27, further comprising the steps of:

- forming a filter body with an internal profile; and
- transferring the filter body with the internal profile to the inlet side of the filter forming module.

29. The method according to any one of claims 19 to 28, further comprising a step of transferring one or more pre-formed inner filter components to the inlet side of the filter forming module.