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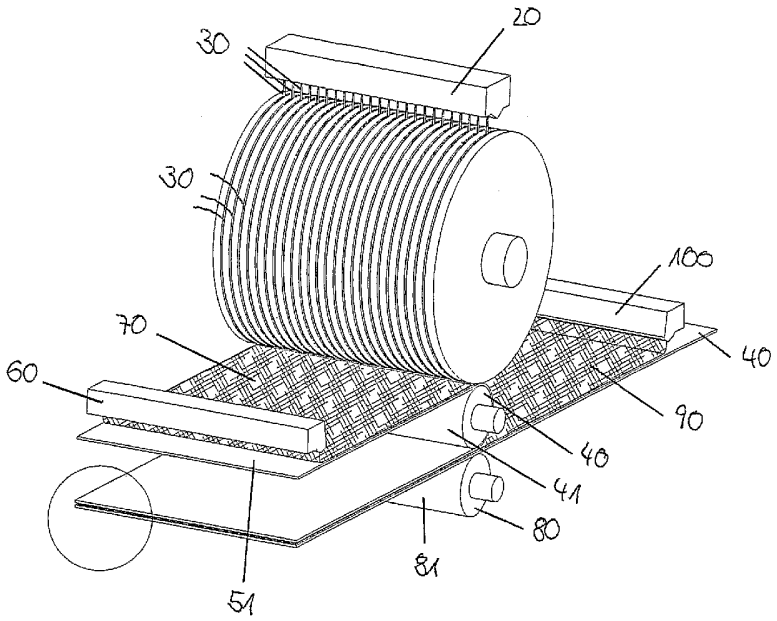
(54) **Title:** PROCESS AND APPARATUS FOR PRODUCING AND APPLYING AN ELASTIC STRAND MATERIAL




(57) **Abstract:** The invention concerns a process and an apparatus for producing a strand or a film substrate, comprising the steps: delivering a liquid, hardenable, preferably thermoplastic material (3) from an applicator opening (21); applying the material to the peripheral surface (12) of a rotatable drum (10); and removing the material (30) from the peripheral surface of the drum. The invention further concerns an apparatus including at least one applicator opening (21) for applying a liquid hardenable material (30) to the peripheral surface (12) of a rotatable drum (10) and a device (10, 40) for removing the material from the peripheral surface of the drum.

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# Process and apparatus for producing and applying an elastic strand material

The invention concerns processes for producing a strand or a film substrate. In addition in a development the process according to the invention is suitable for applying an application material to a substrate and in a further development it is suitable for producing a three-layer product. A further aspect of the invention is an apparatus for carrying out the process according to the invention and the process developments according to the invention.

Processes and apparatuses of the above-indicated kind are used for example in industrial mass production to produce stiff or stretchable strip materials or film substrates or to coat substrates with such strip materials or film substrates. A typical situation of use for such processes and apparatuses is for example the production of hygiene products such as diapers, underlays for hospital hygiene needs or the like.

A process and an apparatus which are suitable for that purpose is disclosed in WO 99/626424. That process provides that a liquefied thermoplastic material is passed to a nozzle opening which at the rear is supplied alternately with the liquefied plastic material and with compressed air whereby the plastic material is put into a turbulent state. That is achieved by virtue of the fact that a rotary slider rotates in a housing and the liquid plastic material is supplied by way of a bore disposed in the rotary slider in the axial direction and issues by way of radial bores in the rotary slider, with a plurality of grooves disposed in axis-parallel relationship being arranged in the surface of the rotary slider and being supplied alternately with medium and with compressed air. The rotary slider is moved past a nozzle slot from which the liquid plastic material and the compressed air are then alternately expelled.

That known apparatus suffers from the disadvantage that it produces an inevitably irregular pattern in respect of the expelled application material and consequently is only suitable for the production of a given coating on a substrate. Furthermore the known apparatus is of a technically complicated and expensive structure and, by virtue of the intensive intermingling of air and application material, regularly requires expensive cleaning and maintenance operations.

A further applicator apparatus is known from WO 99/32233. In that apparatus the liquid application material is introduced into an axial passage of a rotary slider and discharged from the rotating rotary slider by way of radial openings. That apparatus however cannot overcome the disadvantages of the previously described apparatus.

US No 6 502 615 B1 discloses an apparatus for producing a multi-layer product in which a plurality of layers are produced and joined together. The layers can be provided in part in the form of prefabricated roll material. To make the production process flexible, US No 6 502 615 provides that individual layers or all layers are produced by extrusion of a liquid application material. For that purpose, there is disclosed an apparatus in which an application material is extruded by way of a spinning nozzle and in that case turbulence is possibly additionally imparted thereto by an air flow. The apparatus proposed in that fashion suffers from the disadvantage that the properties of the substrate produced in that way depend on a large number of production factors and in part unwanted non-honogeneities can occur. In addition that apparatus is expensive to maintain because of the necessary very small dimensions of the spinning nozzles.

An object of the present invention is to provide a process and an apparatus which as an alternative to known processes and apparatuses permit a larger diversity of strands or film substrates which can be produced. In addition the aim of the apparatus according to the invention and the process according to the invention is to overcome or at least alleviate at least one of the above-mentioned problems.

That object is attained with a process of the kind set forth in the opening part of this specification, which comprises the steps: delivering a liquid, hardenable, preferably thermoplastic material from an applicator opening, applying the material to the peripheral surface of a rotatable drum, and removing the material from the peripheral surface of the drum.

The process according to the invention enjoys the advantage that the material is applied to the outside surface of a rotatable drum and is taken off that outside surface again. The material can be applied to the drum in a liquid or pasty condition and can be removed from the drum again in that condition or in a condition in which it is already partially or completely hardened. It is preferable for the material to be fed from an applicator opening which is stationary with respect to the peripheral surface of the drum and for the drum to rotate in that feed operation so that a strand is formed. A converse procedure is alternatively possible, in which a moved applicator opening applies the material to a stationary drum peripheral surface.

The step of removing the material can be implemented by a special device which shaves or scrapes the material off the drum peripheral surface or lifts it off in another fashion. In addition it is possible for the material to be pulled off by applying a pulling force to the strand or the film substrate and to make use of the cohesive strengths of the application material itself for the removal procedure. A suitable material for use in the process according to the invention is in particular a hot melt adhesive which is applied to the peripheral surface in the heated, liquid or pasty state and which is removed from the peripheral surface in a cooled state.

The process according to the invention can be developed by the step of hardening the material on the peripheral surface of the drum. That step can be achieved for example by a multi-component mixture of a plastic material being applied and by that mixture reacting by chemical reaction on the peripheral surface of the drum and hardening. In addition the application material could be applied in dissolved form and could harden by removal of the solvent, for example by evaporation. The peripheral surface of the drum is therefore to be so designed in particular that such a reaction process or evaporation process is made possible, in particular by virtue of the dimensions of the peripheral surface of the drum and by virtue of the residence time of the material on the peripheral surface of the drum. In particular it is preferable if hardening of the material is achieved by cooling a thermoplastic material, in particular hot melt adhesive. That can be effected in a simple fashion by the heat stored in the thermoplastic material being dissipated by way of the peripheral surface of the drum and/or given off to the environment.

It is further preferred for the drum to be displaced in rotation, in particular by the operation of applying the material to the drum, by an air flow and/or by a drive device. The rotation of the drum is preferably coupled to the operation of applying the material to the drum in order to avoid an excessive or too slight application of material. Coupling can be effected by the drum being driven by means of an electric motor or the like and by actuation of that electric motor being coupled to the application operation. In certain cases it is possible to envisage the operation of applying the material being effected with a significant tangential component and in that way a force being applied to the drum by the application operation itself, that force causing the drum to be displaced in rotation. Furthermore it is advantageous in certain uses to provide an air flow to accompany the application operation, the air flow acting on the application material for example to bring about a cooling effect and also causing rotation of the drum.

It is particularly preferred for the material to be applied to the peripheral surface of the drum over one or more regions, which extend in the axial direction, of the peripheral surface of the drum. In that way it is possible to efficiently produce substrate films by the entire width or at least substantial regions of the entire width of the peripheral surface of the drum being coated with the material and then by a plurality of strands or a continuous substrate film being produced in those regions.

In addition it is particularly preferred if the material is applied into at least one groove which is arranged in the peripheral surface of the drum and extends in the peripheral direction of the drum. Applying the material into a groove makes it possible to achieve preferred and reliable formation of a geometry for the strand, which is substantially uninfluenced by other external production parameters. The groove can preferably extend in the peripheral direction precisely in perpendicular relationship with the axis of rotation of the drum. In certain uses however embodiments of the process are also advantageous in which the groove extends in the peripheral direction inclinedly with respect to the axis of rotation, that is to say the groove is not arranged axially at one location of the drum, but extends over an axial region of the drum.

It is particularly preferable if the material is applied into a plurality of grooves which extend in parallel and which are arranged in the peripheral surface of the drum and which extend in the peripheral direction of the drum. In that way it is possible to simultaneously produce

a plurality of strands which are introduced into the grooves in the peripheral surface in parallel relationship and it is possible in that way to produce a substrate which consists of many strands arranged in mutually parallel relationship.

In a further development of the process according to the invention the peripheral surface of the drum is cooled. That is advantageous for processing a series of materials, in particular for processing thermoplastic materials which go through hardening by virtue of the cooling of the peripheral surface. The cooling action can be effected in particular by the supply of a cooling fluid, for example water or cooling air, which is applied to the outside or inside of the peripheral surface.

The process according to the invention is also suitable for applying an application material to a substrate, with the additional steps of producing a relative movement between the substrate and the rotatable drum and applying the application material after the removal of the application material from the peripheral surface of the drum on to the substrate.

In that respect it is preferable for the substrate to be arranged on a conveyor device and to be moved with respect to a stationary applicator device. That applicator device can include for example an applicator head with a rotatable drum arranged thereat. Application of the application material can be effected for example by rolling the drum on the substrate which is moved relative to the drum axis. In certain uses it is advantageous if the peripheral speed of the drum and the relative movement between the substrate and the axis of the drum are the same. In other uses it is advantageous if the relative movement between the substrate and the drum axis is greater than the peripheral speed of the drum in order in that way to implement stretching of the application material. In that way it is possible to apply to the application material for example an elastic prestressing which, when the application material is applied to the substrate, introduces an advantageous mechanical prestressing in the overall composite.

In addition the process according to the invention can also be used for the production of a three-layer product, with the additional steps of producing a relative movement between a first substrate and the rotatable drum, applying the application material after the removal of the application material from the peripheral surface of the drum on to the first substrate,

and applying a second substrate to the application material disposed on the first substrate.

In that respect it is to be appreciated that application of the application material can be effected in displaced relationship in respect of time or location relative to the operation of applying the second substrate, or alternatively a join which takes place at the same time can be implemented between the first substrate, the application material and the second substrate, at a location in the production procedure. With that development of the process according to the invention, it is particularly advantageous to use a hot melt adhesive as the application material in order in that way, besides the desired mechanical properties of the application material after hardening, also to achieve a bond between the first and second substrate by means of the interposed hot melt adhesive material.

In that respect a development of that process can provide that the first and/or the second substrate is or are produced by the process according to one of preceding claims 1 to 7. In that way there is provided a production line which is highly flexible in terms of production variability and in which both the central layer and also one or both outer layers of the three-layer product are produced directly from a liquid starting material in the production line, thereby achieving very substantial independence from prefabricated substrate materials.

Furthermore it can be advantageous if the first and/or the second substrate is produced by extrusion and intermingling a plurality of liquid, hardenable application material threads. That also permits a flexible manufacturing procedure and it affords a given structure in respect of the first and/or second substrates. The substrates produced in that way by the extrusion of a plurality of application material threads can preferably be produced in accordance with the state of the art set forth in the opening part of this specification.

It is further advantageous if the first or the second substrate is produced by extrusion and intermingling of a plurality of liquid, hardenable application material threads and the second or first substrate respectively is produced by the process according to one of preceding claims 1 to 7. That permits the three layers to be of a composition which is advantageous for many three-layer products and which in addition, by virtue of the individual

layers being formed in the production line itself, affords a high level of flexibility in terms of possible desired production changes, product changes or the like.

The processes and process developments according to the invention as described hereinbefore can be supplemented by additional process steps. Thus in many uses it is advantageous, besides the application process according to the invention, to employ a further application process in order to improve the product properties in a given direction. In addition, in some situations of use, besides the above-described two-layer or three-layer products, it is also advantageous to produce products having more than three layers, insofar as additional layers are also applied in the form of a prefabricated product layer or in the form of a product layer which is produced in the production line.

A further aspect of the invention is an apparatus for producing a strand or a film substrate, including: at least one applicator opening for applying a liquid hardenable material to the peripheral surface of a rotatable drum, and a device for removing the material from the peripheral surface of the drum. That apparatus is suitable in particular for carrying out the process according to the invention. In regard to the effects and advantages of the components of the apparatus according to the invention and the following components constituting further developments in the apparatus according to the invention, attention is suitably directed to the above-described process features and features of further developments of the process.

A particular development of the apparatus can provide that the peripheral surface of the drum is so adapted that the material hardens on the peripheral surface of the drum. The configuration of the peripheral surface of the drum can involve for example a given surface roughness, a given drum diameter and a given material for the drum, which accelerates hardening of the material.

It is further advantageous if the application opening is so arranged that the material displaces the drum in rotation when it is applied to the drum or an air flow device is provided, which flows around the drum and causes it to rotate. That results in coupling of the application operation to drum rotation or coupling of the air flow around the drum to the drum rotation.

In particular it is preferable in a development of the apparatus according to the invention for the apparatus to include a drive device for rotating the drum. Such a drive device can be for example in the form of an electric motor, optionally with a transmission with a variable or fixed step-down or step-up ratio. In particular it is preferable for the at least one applicator opening to be adapted to apply the material to the peripheral surface of the drum over one or more regions, which extend in the axial direction, of the peripheral surface of the drum. In that way preferably a plurality of applicator openings arranged in a line in an axial direction with respect to the drum can be provided, from which a plurality of strands of the application material can extend on to the drum. Furthermore it is advantageous in certain uses to provide a slot nozzle which extends elongatedly in the axial direction and which applies the application material to the drum.

A particularly preferred embodiment of the apparatus according to the invention includes at least one groove which is provided in the peripheral surface of the drum and which extends in the peripheral direction of the drum. The depth of the groove is preferably selected in dependence on the desired height of the strand to be produced so that the strand extends as much as possible only slightly beyond the outside periphery of the drum.

In particular it is possible to provide in the peripheral surface of the drum a plurality of grooves which extend in parallel and which extend in the peripheral direction of the drum. That permits the simultaneous production of a plurality of strands of the material, and that permits particularly efficient and inexpensive production of strands or substrate films from those strands.

In the two above-mentioned embodiments it is advantageous if the groove or grooves in the peripheral surface of the drum is or are so arranged relative to the at least one applicator opening that the material is applied into the groove or grooves. In that way the applicator openings can be arranged in spaced relationship from each other for example in an axially extending line and the grooves can be arranged in the peripheral direction and perpendicularly to the axis of rotation of the drum, wherein the spacing between the longitudinal centre lines of two grooves corresponds to the spacing between the longitudinal centre lines of two suitable corresponding applicator openings. In this embodiment the grooves or the applicator openings associated therewith can all be arranged at an equal

spacing or it is possible to provide different spacings in order in that way to produce the strands at various spacings relative to each other.

It is particularly preferred if the apparatus according to the invention further includes a cooling device for cooling the peripheral surface of the drum. In that respect attention is directed to the preceding description.

A further development of the apparatus can provide a conveyor device for producing a relative movement between a substrate and the rotatable drum, wherein the drum is so arranged that the application material can be applied to the substrate after removal from the drum. By virtue of that development the apparatus is also suitable for applying an application material to a substrate. The conveyor device can be for example in the form of a conveyor belt.

In addition a further development of the apparatus can provide a conveyor device for producing a relative movement between a first substrate and the rotatable drum, wherein the substrate is so arranged that the application material can be applied to the substrate after removal from the drum, and means for bringing the first substrate together with a second substrate so that the second substrate is applied to the application material disposed on the first substrate. That means that the apparatus is also suitable for the production of a three-layer product, as described hereinbefore. In that respect it is preferable if the apparatus in a development thereof further includes a device for producing a film substrate, as described hereinbefore, for producing the first and/or the second substrate. Furthermore a development of the apparatus according to the invention can include a device for producing a film substrate including at least one delivery opening for extruding a plurality of liquid hardenable application material threads for producing the first and/or the second substrate. Those developments afford a considerable degree of flexibility in the production operation with the apparatus according to the invention.

It is particularly advantageous if the apparatus further includes a first device for producing the first or second film substrate, as described hereinbefore, and a second device for producing the correspondingly second or first film substrate, which includes at least one delivery opening for the extrusion of a plurality of liquid hardenable application material

threads, in order in that way to be able to produce three-layer products with particularly preferred laminate properties.

A further development of the apparatus can include a heating device for heating at least parts of the apparatus for processing a thermoplastic material. Such a heating device can be provided for example in the form of electrical resistance heating devices and makes it possible to process thermoplastic materials with the apparatus according to the invention. In that respect not all parts of the apparatus necessarily have to be heated, but often it is sufficient to heat those parts of the apparatus in which the thermoplastic material stays over a comparatively long period of time.

Finally a further aspect of the invention is a hygiene product including a first, water-impermeable layer and a second absorbent layer, characterised by a layer of at least one thread, preferably a plurality of threads, of a hardened plastic material. The hygiene product of such a configuration is made possible in particular by carrying out the process according to the invention with the apparatus according to the invention, and enjoys the advantage of involving a particularly advantageous combination of absorption capability, elastic properties and water-tightness.

A development of the hygiene product can include a layer comprising at least one thread, preferably a plurality of threads, of a hardened elastic material. That permits directed mechanical properties which are particularly advantageous for many uses and which for example can be implemented in the form of specifically targeted pre-stressing of the hygiene product. In particular the threads can be arranged between the first and second layers of the hygiene product. That produces a hygiene product of an attractive external appearance and in addition can permit reliable adhesion of the three layers to each other.

A further development of the hygiene product can provide that the threads comprise a thermoplastic material. Thermoplastic materials are suitable in particular for the desired adhesive properties and elastic properties which are sought for the hygiene product.

Finally it is advantageous if a further development of the hygiene product provides that the first, water-impermeable layer and/or the second absorbent layer comprise a plurality of interconnected threads of a thermoplastic material. That embodiment can combine advan-

tageous mechanical properties with good recyclability of the hygiene product as in that way production of the hygiene product from a single material or at least materials which are chemically and/or physically related is possible in a particularly simple fashion.

The hygiene product according to the invention and the developments thereof can be produced in particular with the process according to the invention and the apparatus according to the invention, as will be apparent to the man skilled in the art.

The invention provides a particularly flexible production process for strands or substrate films comprising such strands and in a development thereof can provide for the application of those strands or substrate films to a substrate or for the production of three-layer or multi-layer products with a layer which is formed by said strands or substrate films. A preferred embodiment of the apparatus according to the invention is described with reference to the accompanying Figures in which:

Figure 1 shows a perspective view inclinedly from top front of the apparatus according to the invention in an embodiment for the production of a three-layer product,

Figure 2 shows a side view of the embodiment of Figure 1,

Figure 3 shows a perspective view inclinedly from the rear of the embodiment of Figure 1,

Figure 4 shows a perspective view inclinedly from the front of the embodiment of Figure 1, and

Figure 5 shows a portion of the region marked with a circle in Figure 4, on an enlarged scale.

Referring to Figures 1 to 4 the apparatus according to the invention includes a drum 10 with a shaft mounting 11 which is mounted rotatably. The drum 10 has a peripheral surface 12 in which a plurality of grooves 13 are arranged in the peripheral direction perpendicularly to the axis of rotation 14 of the drum 10.

Arranged above the drum 10 is a distributor bar 20 which extends parallel to the axis of rotation 14 of the drum and on the underside of which is arranged a plurality of discharge openings 21. The discharge openings 21 are spaced from each other in the lengthwise

direction of the distributor bar 20. The number of discharge openings 21 corresponds to the number of grooves 13. Two adjacent discharge openings 21 are spaced from each other precisely like two adjacent grooves 13.

Each discharge opening 21 of the distributor bar 20 is associated with a groove 13 in the drum 10 and delivers a jet of an application material 30 which is guided into the corresponding groove 13 under the influence of the force of gravity.

The drum 10 rotates in the direction of rotation 15 shown in Figure 2 and thereby transports the material strands introduced into the grooves on the front side, as can be seen in Figures 1 and 4, downwardly in the direction of a deflection roller 40 arranged beneath the drum 10.

A conveyor belt 50 extends around the deflection roller 40 over an angular range of 180°. An application material is delivered on to the conveyor belt 50 on the upper run 51 thereof from a second distributor bar 60 which extends parallel to the distributor bar 20. At its underside the distributor bar 60 has a slot nozzle or a plurality of small nozzle openings and discharges the application material in a manner as is described for example in WO 99/32233, WO 99/62642 and US No 6 502 615, and in that way produces a dense non-woven cloth 70. The non-woven cloth 70 is conveyed in the direction of the underside of the drum 10 by the conveyor belt 50.

The peripheral surface 12 of the drum 10 and the peripheral surface 42 of the deflection roller 40 are spaced from each other in such a way that the non-woven cloth 70 and the material strands 30 are pressed against each other between the drum 10 and the deflection roller 40 and the material strands 30 are thereby removed from the peripheral surface 12 of the drum 10 and adhere to the non-woven cloth 70. The material strands 30 are therefore disposed on the rear side of the roller 40, as can be seen from Figure 3, fixed on the non-woven cloth 70.

Arranged beneath the deflection roller 40 is a backing roller 80 whose axis of rotation is disposed perpendicularly beneath and parallel to the axis of rotation of the deflection roller 40. The non-woven cloth 70 with the material strands 30 arranged thereon passes through

between the deflection roller 40 and the backing roller 80, as well as a second non-woven cloth 90 which is applied by a third distributor bar 10 to a conveyor belt 110.

The distributor bar 100 extends in parallel relationship with the distributor bar 20 and the second distributor bar 60 and is of the same configuration as the distributor bar 60. The second non-woven material 90 which is applied to the conveyor belt 110 by the distributor bar 100 is conveyed by the conveyor belt 110 from the distributor bar 100 in the direction of the intermediate space between the deflection roller 40 and the backing roller 80.

The peripheral surfaces 41, 81 of the deflection roller 40 and the backing roller 80 are spaced from each other in such a way that the first non-woven cloth 70, the material strands 30 arranged thereon and the second non-woven cloth 90 are pressed against each other between the two rollers 40, 80, thus affording adhesion between the material strands and the second non-woven cloth 90. That therefore results in a sandwich structure comprising the first non-woven cloth 70, the second non-woven cloth 90 and the material strands 30 arranged between the two non-woven cloths, as can be clearly seen from Figure 5.

Instead of using endless conveyor belts 50, 110, it is possible in place of the conveyor belts also to feed further layers which can be provided for example by prefabricated layers which are wound up on a roll. In that way it is possible to produce a four-layer or five-layer product in which, in addition to the three layers described hereinbefore, there is also an uppermost cover layer and/or a lowermost cover layer 110.

Claims

1. A process for producing a strand or a film substrate comprising the steps:
- delivering a liquid, hardenable, preferably thermoplastic material (3) from an applicator opening (21),
- applying the material to the peripheral surface (12) of a rotatable drum (10), and
- removing the material (30) from the peripheral surface of the drum.

2. A process according to claim 1 characterised by the step of hardening the material (30) on the peripheral surface (12) of the drum (10).

3. A process according to claim 1 or claim 2 characterised in that the drum (10) is displaced in rotation, in particular by the operation of applying the material to the drum, by an air flow and/or by a drive device.

4. A process according to one of the preceding claims characterised in that the material is applied to the peripheral surface of the drum over one or more regions, which extend in the axial direction, of the peripheral surface (12) of the drum.

5. A process according to one of the preceding claims characterised in that the material is applied into at least one groove (13) which is arranged in the peripheral surface (12) of the drum and extends in the peripheral direction of the drum.

6. A process according to one of the preceding claims characterised in that the material is applied into a plurality of grooves (30) which extend in parallel and which are arranged in the peripheral surface of the drum and which extend in the peripheral direction.

7. A process according to one of the preceding claims characterised in that the peripheral surface of the drum is cooled.

8. A process according to one of the preceding claims for applying an application material (30) to a substrate (70) comprising the steps:
- producing a relative movement between the substrate and the rotatable drum (10), and

- applying the application material after the removal of the application material from the peripheral surface of the drum on to the substrate.

9. A process according to one of the preceding claims for producing a three-layer product comprising the steps:
- producing a relative movement between a first substrate (70) and the rotatable drum (10),
- applying the application material (30) after the removal of the application material from the peripheral surface of the drum on to the first substrate (70, and
- applying a second substrate (90) to the application material disposed on the first substrate.

10. A process according to claim 9 characterised in that the first and/or the second substrate is produced by the process according to one of preceding claims 1 to 7.

11. A process according to claim 9 or claim 10 characterised in that the first and/or the second substrate is produced by extrusion and intermingling of a plurality of liquid, hardenable application material threads (30).

12. A process according to claim 9 characterised in that the first or the second substrate is produced by extrusion and intermingling of a plurality of liquid, hardenable application material threads and the second or first substrate respectively is produced by the process according to one of preceding claims 1 to 7.

13. Apparatus for producing a strand or a film substrate including:
- at least one applicator opening (21) for applying a liquid hardenable material (30) to the peripheral surface (12) of a rotatable drum (10), and
- a device (10, 40) for removing the material from the peripheral surface of the drum.

14. Apparatus according to claim 13 characterised in that the peripheral surface (12) of the drum is so adapted that the material hardens on the peripheral surface of the drum.

15. Apparatus according to claim 13 or claim 14 characterised in that the material and/or an air flow is applied to the drum in such a way that the drum is set in rotation.

16. Apparatus according to one of preceding claims 13 to 15 characterised by a drive device for rotating the drum.

17. Apparatus according to one of preceding claims 13 to 16 characterised in that the at least one applicator opening (21) is adapted to apply the material to the peripheral surface of the drum over one or more regions, which extend in the axial direction, of the peripheral surface of the drum.

18. Apparatus according to one of the preceding claims characterised in that provided in the peripheral surface of the drum is at least one groove (13) which extends in the peripheral direction of the drum.

19. Apparatus according to one of the preceding claims characterised in that provided in the peripheral surface of the drum are a plurality of grooves (13) which extend in parallel and which extend in the peripheral direction of the drum.

20. Apparatus according to claim 18 or claim 19 characterised in that the groove or grooves in the peripheral surface of the drum is/are so arranged relative to the at least one applicator opening that the material is applied into the groove or grooves.

21. Apparatus according to one of the preceding claims characterised by a cooling device for cooling the peripheral surface of the drum.

22. Apparatus according to one of preceding claims 13 to 21 for applying an application material to a substrate (70) including:

- a conveyor device for producing a relative movement between a substrate and the rotatable drum, wherein
- the substrate is so arranged that the application material can be applied to the substrate after removal from the drum.

23. Apparatus according to one of preceding claims 13 to 22 for producing a three-layer product including:

- a conveyor device for producing a relative movement between a first substrate (70) and the rotatable drum (10), wherein
- the substrate (70) is so arranged that the application material (30) can be applied to the substrate after removal from the drum, and
- bringing the first substrate together with a second substrate (30) so that the second substrate is applied to the application material disposed on the first substrate.

24. Apparatus according to claim 23 characterised by a device (60; 100) for producing a film substrate according to one of preceding claims 13 to 21 for producing the first and/or the second substrate.

25. Apparatus according to claim 23 characterised by a device (60; 100) for producing a film substrate including at least one delivery opening for extruding a plurality of liquid hardenable application material threads and a device for intermingling the application material threads for producing the first and/or the second substrate.

26. Apparatus according to claim 23 characterised by a first device (60) for producing the first or second film substrate according to one of preceding claims 13 to 21 and a second device (100) for producing the correspondingly second or first film substrate including at least one delivery opening for the extrusion of a plurality of liquid hardenable application material threads and a device for intermingling the application material threads.

27. Apparatus according to one of preceding claims 13 to 26 characterised by a heating device for heating at least parts of the apparatus for processing a thermoplastic material.

28. A hygiene product including:
a first, water-impermeable layer (70) and a second absorbent layer (30), characterised by a layer (30) of at least one thread (30), preferably a plurality of threads (30), of a hardened elastic material.

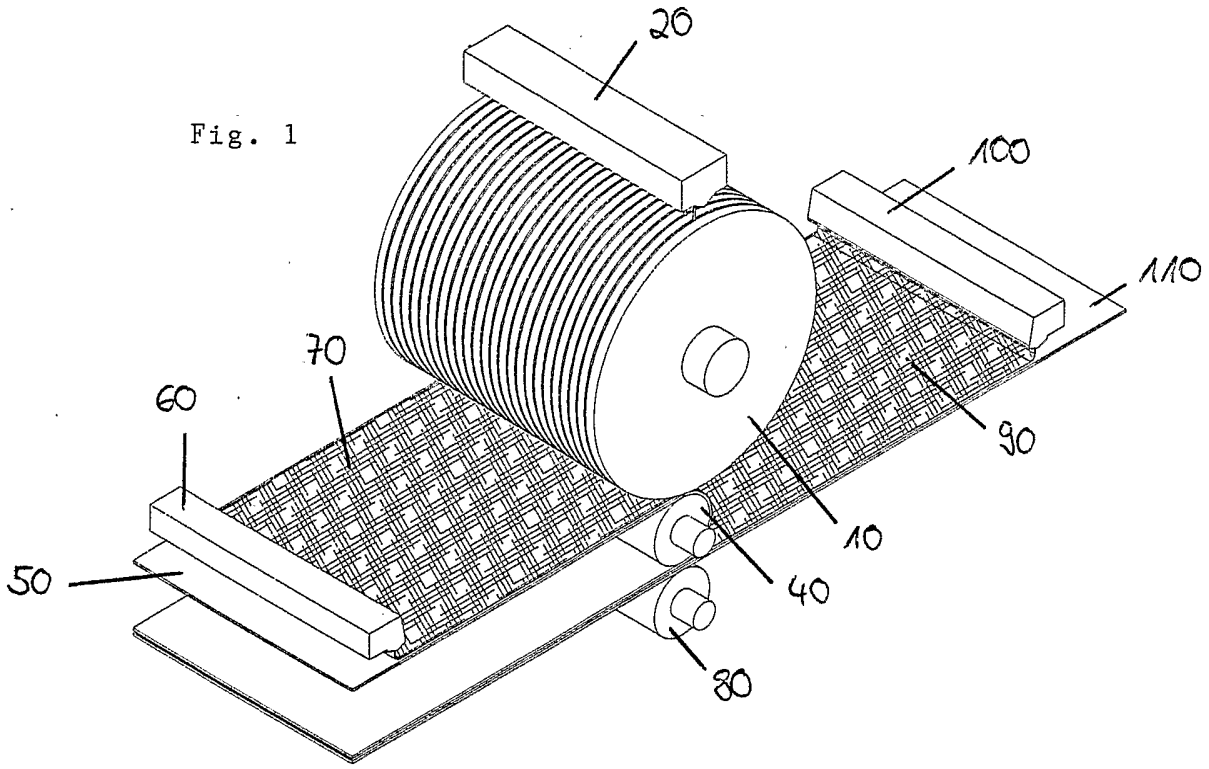
29. A hygiene product according to claim 28 characterised in that the threads are oriented in mutually parallel relationship.

30. A hygiene product according to claim 28 or claim 29 characterised in that the threads are arranged between the first and second layers.

31. A hygiene product according to one of preceding claims 28 to 30 characterised in that the threads comprise a thermoplastic material.

32. A hygiene product according to one of preceding claims 28 to 31 characterised in that the first, water-impermeable layer and/or the second absorbent layer comprise a plurality of interconnected threads of a thermoplastic material.

Fig. 1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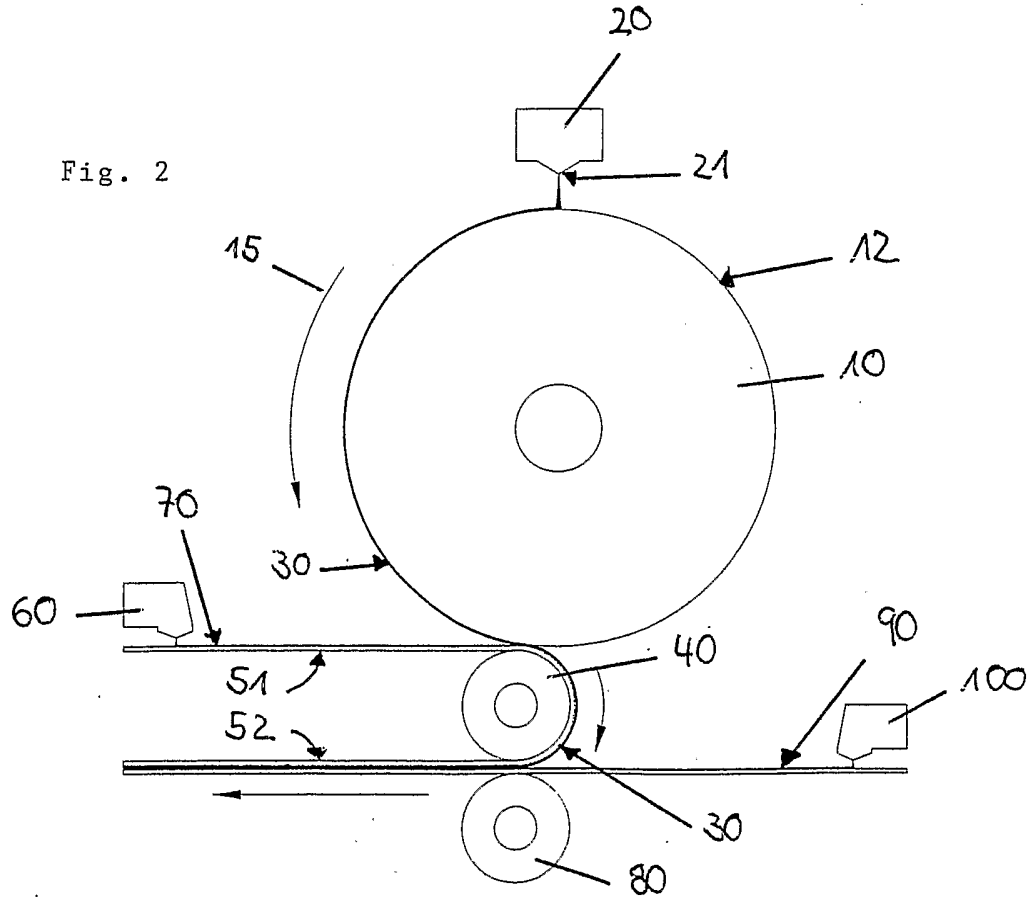
40
80

Fig. 2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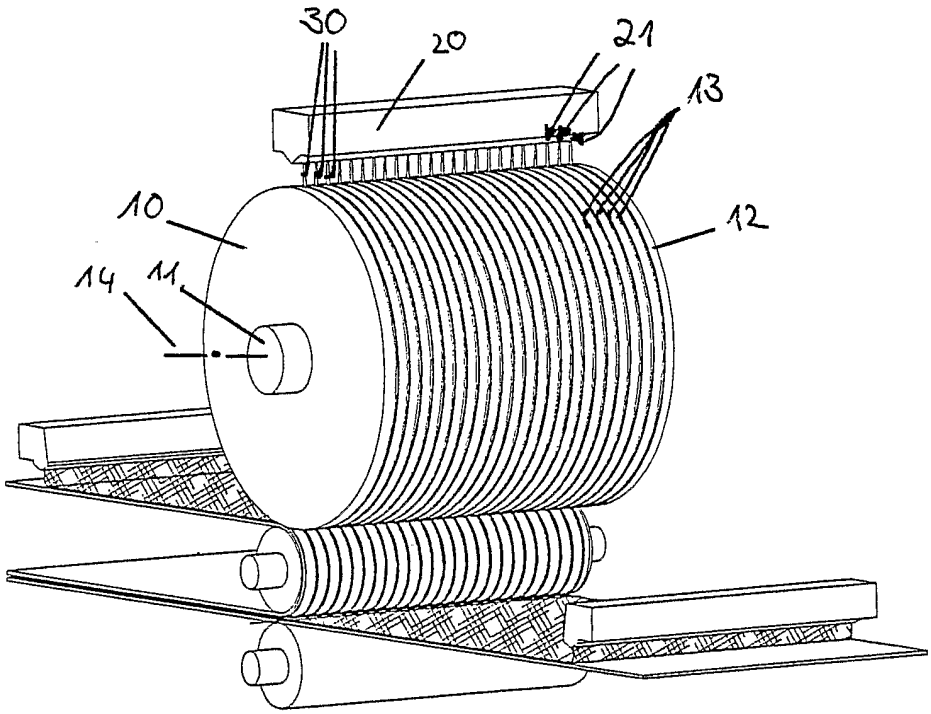


Fig. 3

Fig. 4

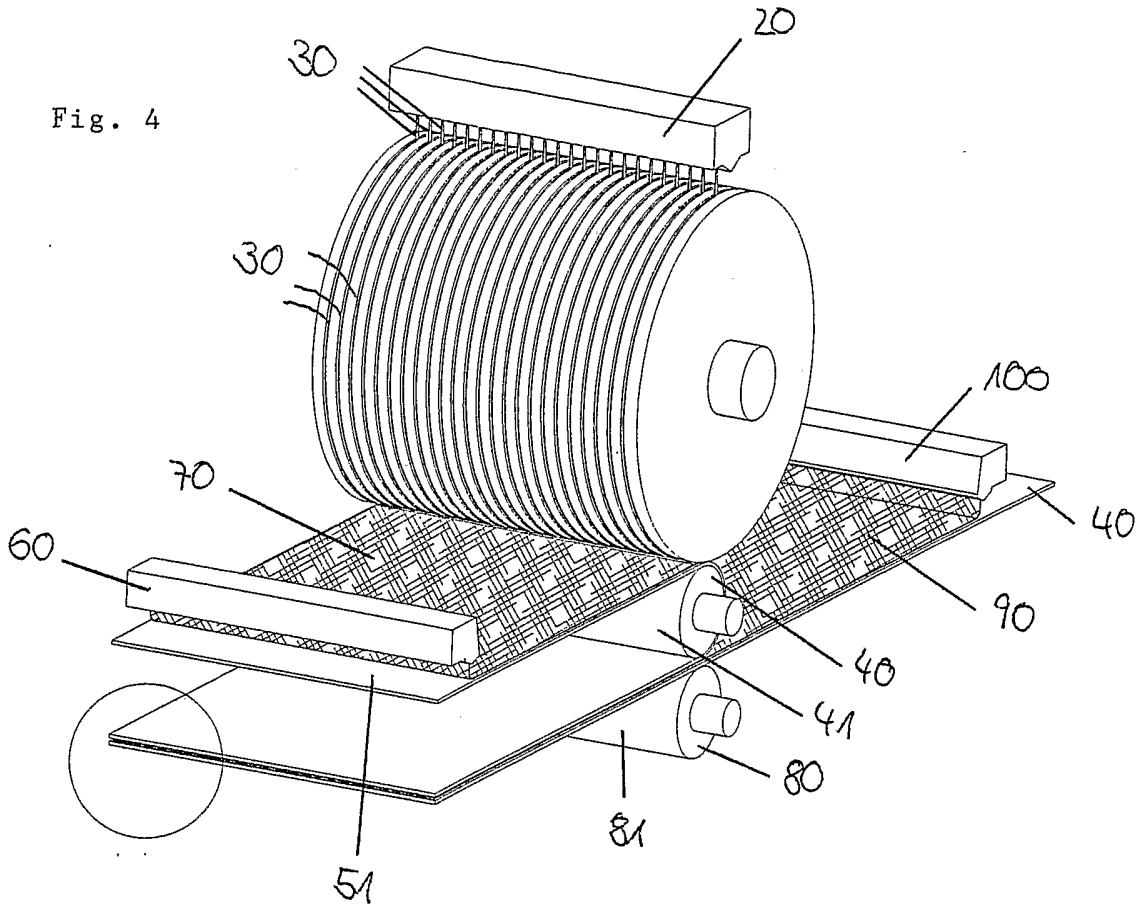


Fig. 5