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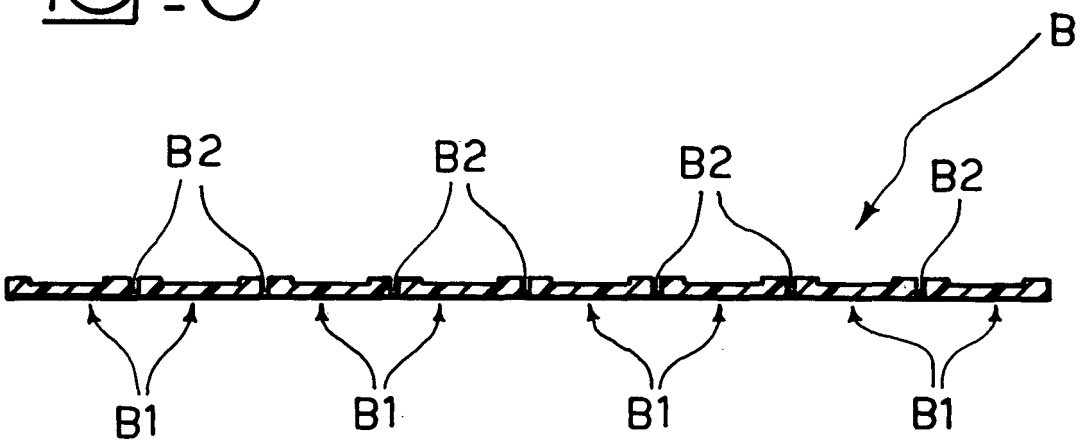
(54) A thread for synthetic grass turfs, die for producing same related processes of manufacturing and use, and synthetic grass turf including it

(57) A yarn (B') for forming filiform formations of a synthetic-grass covering reproducing the grassy sward of natural turf comprises a plurality of filiform segments (B1') set alongside one another and connected together by thin breakable connection portions (B2'), in which the filiform segments (B1') present thickened end parts. Preferably the yarn (B') is obtained by longitudinal stretching, starting from a length (B) constituted by a strip comprising a plurality of filiform segments (B1) set alongside one another and connected together by thin connection portions (B2).

Fig.3



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Description

[0001] The present invention relates to synthetic (or "artificial") grass coverings.

[0002] Synthetic-grass coverings have been used for quite some time now, in particular to provide areas of greenery for urban decoration and similar amenities, for areas for bordering swimming-pools, and, in general, for replacing natural-grass cover in all those conditions where the laying and maintenance of a natural-grass cover may prove critical. The use of said synthetic-grass coverings has received new impulse in recent times in order to provide coverings for sports facilities, for example, soccer pitches. The corresponding literature is extremely extensive, as is witnessed, at a patent level, by documents such as: US-A-3 731 923, US-A-4 337 283, US-A-5 958 527, US-A-5 961 389, US-A-5 976 645, JP-B-32 53 204, JP-A-10037122, DE-A-44 44 030, EP-A-0 377 925, and EP-A-1 158 099.

[0003] In particular, from the document mentioned last, which is owned in the name of the owner of the present application, a synthetic-grass structure is known, which comprises a sheet-like substrate with a plurality of filiform formations extending from the substrate for simulating the grassy sward of natural turf, and a particulate filling material, or infill, dispersed between the filiform formations so as to keep the filiform formations themselves in a substantially upright condition. Specifically, the above synthetic-grass covering is characterized in that the particulate filling material (infill) is constituted by a substantially homogeneous mass of a granular material chosen in the group constituted by polyolefin-based materials and by vinyl polymer-based materials.

[0004] Further advantageous developments of the above solution are described in the documents EP-A-1 319 753, EP-A-1 375 750, EP-A-1 371 779, as well as EP-A-1 486 613, and again the European patent application No. 05425957.7, all of said documents being owned by the owner of the present application.

[0005] In the course of the last few years, as regards application to the production of grass coverings for sports facilities, the activity of innovation has been aimed chiefly at the characteristics and modalities of distribution of the filling material or infill.

[0006] As a whole, less attention has instead been paid to the characteristics of the yarn used for making said filiform formations. In this connection, reference may be made, for example, to EP-A-0 259 940, which describes, instead, the possibility of using, in a synthetic-grass covering, a yarn obtained with the coextrusion of polymeric materials of different composition, in particular with different coefficients of friction.

[0007] A solution still widely used for making the aforesaid filiform formations envisages resorting to a yarn having a base of plastic material, such as polyethylene. The material in question is initially laminated so as to form a sheet or web of the thickness of, for example, 200 - 300 micron. The sheet is then subjected to a cutting operation, which divides the sheet into a large number of strips of small width (for example, 10 - 20 mm).

[0008] The cutting operation is usually followed by one or more operations of longitudinal stretching and fibrillation. For this purpose, the web is divided into strips of given width, which are stretched and then pre-fibrillated, i.e., incisions are made in a longitudinal direction, to give rise, during normal use, to progressively thinner threads, in the direction of the width. The material is gathered as a ribbon or tape on a bobbin or reel, which usually passes it on to a subsequent step of twisting of the thread, thus enabling it to be treated in the subsequent processing steps (e.g., tufting on the loom).

[0009] The above type of yarn is the first to have asserted itself on the market on a large scale on account of ease of production in all the steps of the process. The final aesthetic appearance of the yarn is not optimal as regards reproducing the appearance of the sward of natural grass cover, but is considered acceptable by the market. A practically inevitable defect in this type of yarn lies in the fact that, when four to five years have elapsed from its being laid, the corresponding coverings manifest problems of wear due to an excessive, uncontrolled and uncontrollable fragmentation during use (breaking of parts of thread, formation of very thin and brittle strips, with the possible formation of dust on account of the breaking-down/degradation of the thread, etc.).

[0010] An alternative technique envisages the formation of a single-thread or single-strand yarn via the formation of individual threads directly from a threading die. The threads in question are stretched and gathered with four, six or eight threads per tuft, before passing on to the subsequent steps as described above (gathering, twisting, tufting). This technique is increasingly asserting its presence on the market because it does not give rise to the problems of wear described above in relation to a fibrillated yarn: single-stranded yarn is not subject over time to undesirable phenomena of splitting or fragmentation. The single-thread technique presents, however, various weakpoints. There exists in the first place a difficulty of production in gathering the individual threads (even though they are grouped together in groups of four, six or eight threads) on the reels, as well as a similar, if not greater, difficulty in the twisting operation. In the end product the strength/toughness of anchorage of the threads to the substrate of the synthetic-grass covering, albeit accepted by the market and in compliance with the existing technical requirements, is not comparable to that of the "fibrillated" material described previously. This is explicable by the fact that the individual (single) threads that make up a single tuft have the possibility of sliding on one another also at the point where the loop is fixed to the substrate (usually with a latex).

[0011] For the sake of completeness, it should again be recalled that there exists yet a third type of yarn constituting a sort of hybrid between the preceding ones, defined as "monotape". For the manufacturing process, the production cycle indicated for the fibrillated product

described at the start is in practice followed, cutting from the original sheet or web strips of smaller width, without using any process of pre-fibrillation, then gathering together the four, six or eight strands per tuft and passing on to the subsequent operations, etc. This technique, which presents various problems, has had little commercial success and is in fact disappearing from the market.

[0012] From WO-A-2004/106601, taken as model for the preamble of Claim 1, a technique is known, in which a multilayer strip is obtained from a film extruded from a threading die through a nozzle provided with projections. The projections form in the strip grooves designed to form preferential sites of splitting of the strip during fibrillation. In this way, it is claimed, a subsequent random post-fibrillation of the yarn such as to reduce the resilience of the synthetic-grass covering, would be prevented.

[0013] As has already been mentioned, whatever the technique of production adopted, the yarn is usually wound on reels used for supplying workstations that produce the basic structure of a synthetic-grass covering of the type described previously, i.e., with the filiform formations that extend from a sheetlike substrate. Said workstations operate typically with known techniques resembling techniques of tufting or the like.

[0014] In particular, said techniques aim at "implanting" in a sheetlike substrate (which is either continuous or substantially continuous, for example, because it is provided with draining holes) yarn formations having a general U-shaped configuration. Each formation basically constitutes a sort of tuft with a looped part that passes underneath the substrate and two lateral branches that extend vertically above the substrate, to simulate blades of grass. In the case of the single thread, the tuft is constituted by four, six or else eight strands or blades according to the thickness and/or width of each blade.

[0015] Albeit as a whole satisfactory, these traditional techniques leave room for further improvements, oriented in various directions.

[0016] In particular, there has been felt the need for a technique for producing yarn for grass coverings that, substantially, combines within it the positive aspects of the various techniques described previously, without sharing their drawbacks, and in particular presents the stability and resistance to subsequent fragmentation typical of single-stranded yarn, thus preventing the critical aspects linked to the need to combine a plurality of (single) threads to form a single tuft, and ensuring at the same time the strength/toughness of anchorage to the substrate typical of fibrillated yarn, this being achieved within the context of a process of production, which is moreover simple, reliable and efficient and affords the possibility of achieving a further improvement as regards the faithfulness in the reproduction of the appearance of the sward of natural grass cover.

[0017] According to the present invention, this need is met thanks to a yarn having the characteristics referred to specifically in the ensuing claims. The invention also relates to a corresponding process for manufacturing said yarn, as well as a corresponding process of use for the purpose of making a synthetic-grass covering (either with or without infill).

[0018] The claims form an integral part of the technical disclosure provided herein in relation to the invention.

[0019] The invention will now be described, purely by way of a non-limiting example, with reference to the annexed plate of drawings, in which:

- Figure 1 is a functional block diagram of a plant for the production of a yarn of the type described herein;
- Figure 2 is a plan view of a portion of a threading die used for forming a yarn of the type described herein;
- Figures 3 and 4 illustrate the yarn in question in two subsequent steps of the manufacturing process;
- Figure 5 is a schematic illustration of the criteria with which the yarn described herein can be used for making a synthetic (or "artificial") grass covering; and
- Figures 6 and 7 illustrate a yarn of the type described herein, respectively immediately after production and in a subsequent step, after application of mechanical stress.

[0020] In Figure 1, the reference number 10 designates as a whole a plant that can be used for producing a yarn that is to be used for the production of synthetic-grass coverings.

[0021] The plant 10 is represented in the form of a set of processing stations that are here supposed as being located in a single site and designed to carry out a processing cycle comprising different operations of treatment performed in cascaded fashion one after the other. Persons skilled in the sector will moreover appreciate that the aforesaid operations can, however, be performed in different premises or contexts and at different times, after prior storage and/or transfer of the intermediate products of the various processing steps illustrated.

[0022] In particular, the reference number 12 designates an extruder for plastic materials which operates with a vertical axis. A plastic material in the molten state is fed into the extruder 12 through an inlet duct 14, to undergo extrusion in a threading die 16 constituted, for example, by a die with an annular profile.

[0023] In particular, in the examplary of embodiment illustrated herein, which is provided merely by way of example, the annular threading die 16 is constituted by a certain number of arched portions 160, separated from one another by a distance, for example of 1 - 2 cm. Each portion of a threading die 160 is designed to produce a respective strip B and has the profile illustrated in Figure 2. For instance, Figure 2 can be considered as a plan view from beneath of the single arched portion 160 of a threading die, as ideally viewed from beneath, i.e., from the area in which the respective strip B drops as it comes out of the threading die.

[0024] In practice, the single portion of a threading die 160 has a certain length (for example, 50 - 60 mm, typically 56.4 mm) measured along its arched path of ex-

tension and comprises a certain number of segments 162 (eight in number, in the example illustrated).

[0025] Each segment 162 has then a length (once again measured along the arched path of extension of the portion of a threading die 160 of which the segment forms part) in the region of 6.7 mm and is connected to the adjacent segments 162 (or to the adjacent segment, in the case of the two end segments 162 in the portion of a threading die 160) by a thin portion or stretch 164.

[0026] Each thin portion 164 has a length, for example, of 0.4 mm, and a width or thickness (dimension in the radial direction with respect to the path of extension of the portion of a threading die 160) of, for example, 0.15 mm.

[0027] An important characteristic of the segments 162 is that they have a U-shaped cross section, hence one with two wider end parts or branches 1620 (once again the dimension in the radial direction with respect to the arched path of extension of the portion of a threading die 160) with respect to the central part 1622.

[0028] For simplicity of illustration, in Figure 2 the widened end parts 1620 and the central part 1622, which is narrower, are designated expressly by the corresponding reference numbers only in the segments 162 that occupy the end positions within the portion of a threading die 160 illustrated.

[0029] It will on the other hand be appreciated that the U shape is not to be considered imperative, since the characteristic of the end parts 1620 that are wider than the central part 1622 can be achieved also with other shapes (for example, a "bone" shape).

[0030] Purely by way of example, the end parts 1620 can present a width or thickness (once again the dimension in the radial direction with respect to the arched path of extension of the portion of a threading die 160) of 0.67 mm as against a width or thickness of the central part 1622 of 0.46 mm.

[0031] It is on the other hand evident that all the dimensional values mentioned previously are given purely by way of example and are not to be interpreted in a way that might in any sense limit the scope of the invention described herein.

[0032] At output from the threading die 16, there are hence present a plurality of strips B, each of which has, if viewed in cross section, the profile represented in Figure 3: this is, in other words, a profile complementary to the profile of the portion of a threading die 160 described previously with reference to Figure 2, hence a profile in which it is possible to distinguish a certain number (eight, in the example illustrated) of segments B1 connected to one another by slender portions B2, with each segment B1 presenting a profile (roughly U-shaped, in the example illustrated herein) with end parts that are wider than the central part.

[0033] The material used for forming the strips B is usually a polyolefin-based material, such as a material chosen from the group constituted by polyethylene, polypropylene and/or mixes and/or copolymers thereof, polyethylene representing the currently preferred choice.

[0034] The material in question is usually pigmented so as to present *en masse* a colouring such as typically a green colouring, it being evident that this characteristic is not to be understood as in any sense limiting the scope of the invention.

[0035] Usually, the strips B coming from the threading die 16 are subjected to cooling by being dipped in a cooling bath contained in a tank 18 so as to enable their consolidation.

[0036] As has already been mentioned, each of the strips B reproduces the profile of drawing conferred upon it by the respective portion of a threading die 160, and is thus in the form of a strip constituted by a plurality of (for example, eight) filiform elements B1 (with widened ends, hence thickened with respect to the central part), set alongside one another and connected together by more slender connection portions B2.

[0037] Usually, as it is lowered into the cooling bath 18, each strip B tends to stretch out so that the substantial identity of shape with the portion of a threading die 160 does not usually correspond to an identity of dimensions. For example, the strip B can present a width in the region of 20 mm, with the segments B1 and the slender portions B2 that have homologous dimensions of width, respectively of 2.4 mm and 0.12 mm.

[0038] The dimensions of thickness can instead be approximately 300 micron and approximately 30 micron, respectively, for the segments B1 (maximum thickness in an area corresponding to the thickened ends) and for the slender portions B2.

[0039] Once again it is recalled that all the dimensional values, as quoted throughout the present description are provided purely by way of example and are not to be interpreted as in any sense limiting the scope of the invention described herein.

[0040] In any case, the slender connection portions B2 preferably have a thickness sufficient to cause them not to be brittle in normal conditions of manipulation of the strip B, where by "normal conditions of manipulation" is meant the conditions corresponding to the fact that the strip B is gripped by a person with his hand and felt, for example, by winding it around his fingers.

[0041] The strip B or each strip B consolidated by cooling (the solution herein represented, which envisages the simultaneous formation of a number of strips B, constitutes only a preferred, but non-imperative, embodiment of the invention) is then to be fed into a drawing assembly, for example, with motor-driven rollers, designated as a whole by 20.

[0042] The strip or strips B can be taken up in the course of a process that is either continuous (and in this case there will usually be provided one drawing assembly 20 for each strip B) or else discontinuous, in this case envisaging a gradual emptying from the tank 18 of the web/strips B that gradually accumulate therein.

[0043] It will likewise be appreciated that recourse to a technique of cooling by dipping constitutes just one

from among the many choices possible for achieving the desired result of cooling/consolidation of the strip or strips B. Other techniques for achieving cooling are represented, for example, by exposure to the environment or else by exposure to jets of air or aeriform for cooling upon exit from the threading die 16.

[0044] Starting from the drawing assembly 20, the strip or strips B (in what follows reference will be made to just one strip, for reasons of simplicity of treatment) is/are sent on to an assembly for longitudinal stretching 22.

[0045] In a way in itself known, this assembly is normally constituted by an oven for heating the material and two or more sets of motor-driven rollers, each comprising two counter-rotating rollers, between which the strip B is made to advance (from left to right as viewed in Figure 1) in conditions in which the peripheral or tangential speed of the pairs of rollers (hence the speed imparted upon the strip B) increases gradually.

[0046] In this way, the strip B is subjected, in one or more stages, to an overall action of longitudinal stretching. For example, it is possible to operate (in a way in itself known) so as to apply a ratio of stretching of between 4:1 and 5:1 understood as the ratio between the rate of advance after and before the heating/stretching oven.

[0047] The overall effect of this stretching is represented in Figure 4, where the reference B' designates the strip at output from the stretching unit 22.

[0048] The strip B' subjected to stretching (in what follows also referred to, for reasons of brevity, as "yarn") has a width and a thickness that are smaller than that of the starting strip B, having, however, preserved in a practically unaltered way (for well-known physical reasons) its cross-sectional profile during stretching.

[0049] Consequently, also the yarn B' deriving from stretching is obtained, if viewed in cross section as represented in Figure 3, in the form of a strip of the width of, for example, 9-10 mm constituted (as in the case of the "length" of strip B from which it has been obtained) by a plurality of filiform segments B1' set alongside one another and connected together by more slender connection portions B2', with the segments B1' that have thickened end parts.

[0050] For example, in the case of the yarn B', the segments B1' can have a width of 1.1 - 1.3 mm and a thickness (maximum, in an area corresponding to the thickened ends) of 130 - 150 micron. The slender connection portions B2' can instead typically have a width of approximately 30 micron and a thickness of 10 micron in the thinnest area.

[0051] Once again it is recalled that the aforesaid dimensional values are provided purely by way of example and are not to be interpreted as in any sense limiting the scope of the invention described herein.

[0052] In any case, the slender portions B2' are very brittle, so that the single yarn B' can be easily fibrillated, i.e., split into individual threads, each corresponding to one of the segments B1', by breaking the slender portions B2' with a modest stress such as the one deriving from the operation of twisting normally performed for winding the yarn B' onto reels R according to the modalities and for the purposes described in the introductory part of the present description. The strip B' thus behaves as a true strip, with all the resulting advantages, until the operation of twisting, when the strip then divides up into the individual strands.

[0053] In Figure 1, the reference number 24 indicates a processing station, which, operating according to criteria in themselves known (i.e., basically according to techniques of tufting or the like) enables formation, starting from the yarn B' wound on reels R, of a synthetic-grass covering designated as a whole by S.

[0054] This is basically a synthetic-grass structure S that comprises a sheetlike substrate K, from which there extends a plurality of filiform formations (constituted by the yarn B') that simulate the grassy sward of natural grass cover.

[0055] Specifically, the weaving station 24 operates by "implanting" in the sheetlike substrate K formations each comprising a sort of tuft of yarn B' having a looped part L that passes underneath the substrate K and two lateral branches that extend vertically above the substrate K, simulating blades of grass.

[0056] The synthetic-grass structure S is suited to receiving (once again according to altogether known criteria) a filling with particulate material F dispersed between the filiform formations so as to keep the filiform formations themselves in a substantially upright condition. For example, the particulate filling material (infill) F in question may be constituted by a substantially homogeneous mass of a granular material chosen from the group constituted by materials with a base of polyolefin and by materials with a base of vinyl polymer.

[0057] In any case, the characteristics of operation of the weaving station 24 and the criteria of production of the synthetic-grass covering S do not constitute elements of specific importance for the purposes of an understanding and implementatioon of the present invention. The solution according to the invention is suited in fact to being used also in the context of synthetic-grass coverings made according to criteria different from the ones represented in Figure 4.

[0058] For example (and without evidently wishing to limit the scope of the invention in any way), the filiform formations that extend above the sheetlike substrate K, instead of having their distal ends free (according to the plush or velvety configuration, represented in Figure 4) can instead be connected to one another, creating loop formations.

[0059] Figures 6 and 7 illustrate the appearance of a length of yarn B', respectively before and after separation of the individual segments B1' deriving from breaking of the slender portions B2' originally connecting the segments themselves. After their separation, the segments B1' preserve their individuality precisely, without undergoing further fragmentation.

[0060] Unlike what happens in fibrillation treatments

of a traditional type, the structure of the yarn B' means that the yarn B' itself gives rise to a plurality of filiform elements B1', the characteristics of which are defined precisely, for example, so that (according to a currently preferred, but non-imperative, embodiment) the filiform elements B1' are substantially the same as one another.

[0061] The expression "currently preferred, but non-imperative, embodiment" is intended to take into account the fact that, in some applications, the fact that the filiform segments B1' (and hence the segments B1 of Figure 3 and the segments 1600 of the portion of a threading die 160), which are not the same as one another, but present different dimensions (being, for example, alternatively, "wide" and "narrow"), may be considered preferable.

[0062] Whatever the choice adopted, the solution described herein in any case prevents one of the traditional drawbacks of the operations of fibrillation, namely, the fragmentation of each blade of yarn in an irregular (in effect random) way, with the consequent formation of fibrils of different width, frequently so thin as to break up and crumble under minimum stress. At the same time, the solution described herein does not alter appreciably the criteria of production of the synthetic-grass covering S, in particular as regards the development of the operation of "weaving" of the synthetic-grass covering. In particular, the (somewhat burdensome) operation, inevitably required by single-thread techniques, namely of having to aggregate a certain number of single threads to form a tuft, is avoided.

[0063] Persons skilled in the sector will likewise appreciate that the operation of separation of the segments B1' (i.e., breaking of the slender portions B2') is not in any way indissolubly linked to the possible re-twisting of the yarn B'.

[0064] Purely by way of example, the operation of separation of the segments B1' (breaking of the slender portions B2') can be performed or completed after the yarn B' has been woven with the substrate K, for example, with an operation of brushing of the synthetic-grass covering formed by the yarn B', performed, for instance, with a rotary brush that subjects the yarn B' to mechanical stress, bringing about fragmentation of the yarn itself in an area corresponding to the slender portions B2'.

[0065] Albeit without wishing to be tied down to any specific theory in this connection, the present applicant has reasons to believe that the precision with which the segments B1' are separated from one another, for example, following upon mere twisting of the strip or strip B' of which the segments themselves originally form part, as well as the fact that, after separation, the segments preserve precisely their own individuality, without undergoing further fragmentation, are indissolubly linked to the mechanism of formation of the aforesaid strip B' (and of the strip B from which the same is obtained by stretching), i.e., to the fact that the segments B1' (and B1) present end parts (between which there extend the slender portions B2' and, respectively, B2) thickened with respect to the central part, a fact which in turn derives from the portions of a threading die 160, in which the segments 162 have end parts 1620 that are wider than the central part 1622.

[0066] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary, even extensively, with respect to what is described and illustrated herein purely by way of non-limiting example, without thereby departing from the scope of the invention as defined by the annexed claims.

Claims

1. A yarn (B') for forming filiform formations of a synthetic-grass covering (S) reproducing the grassy sward of natural turf, said yarn (B') comprising a plurality of filiform segments (B1') set alongside one another and connected together by thin breakable connection portions (B2'), said yarn being **characterized in that** said filiform segments (B1') present thickened end parts.

2. The yarn according to Claim 1, **characterized in that** said filiform segments (B1') have a profile with a U-shaped cross section.

3. The yarn according to Claim 1 or Claim 2, **characterized in that** said thin connection portions (B2') have, where breakable, a thickness substantially equal to 10 micron.

4. The yarn according to any one of the preceding claims, **characterized in that** said filiform segments (B1') are substantially identical to one another.

5. The yarn according to any one of the preceding claims, **characterized in that** said yarn (B') is made of a polyolefin-based material.

6. The yarn according to Claim 5, **characterized in that** said polyolefin-based material is selected from the group constituted by polyethylene, polypropylene, and/or mixes and/or copolymers thereof.

7. The yarn according to Claim 5, **characterized in that** said polyolefin-based material is polyethylene.

8. The yarn according to any one of the preceding claims, **characterized in that** it is made of a material (B) subjected to stretching.

9. The yarn according to any one of the preceding claims, **characterized in that** it is obtained starting from material (B) drawn through a threading die (16).

10. A threading die for forming a yarn according to any one of the preceding claims, **characterized in that** said threading die (16) comprises at least one portion

of a threading die (160) with a plurality of segments set alongside one another (162), having thin connection portions (164), extending there between in which said segments set alongside one another (162) present end parts (1620) that are wider than the central part (1622).

11. The threading die according to Claim 10, **characterized in that** it comprises a plurality of said portions of a threading die (160), which extend as a whole according to an annular path.

12. A process for forming a yarn according to any one of the preceding Claims 1 to 9, the process comprising the steps of:

- providing a length (B) of said yarn (B') said length (B) being constituted by a strip comprising a plurality of filiform segments (B1) set alongside one another and connected together by thin connection portions (B2); and
- subjecting said length of yarn (B) to longitudinal stretching (22) so as to form said yarn (B').

13. The process according to Claim 12, **characterized in that** it comprises the operation of forming said length (B) of yarn with said thin portions (B2) that are non-breakable in normal conditions of manipulation of said length of yarn (B).

14. The process according to Claim 12 or Claim 13, **characterized in that** it comprises the operation of forming said length (B) of yarn (B) with said thin portions (B2) presenting a minimum thickness of substantially 30 micron.

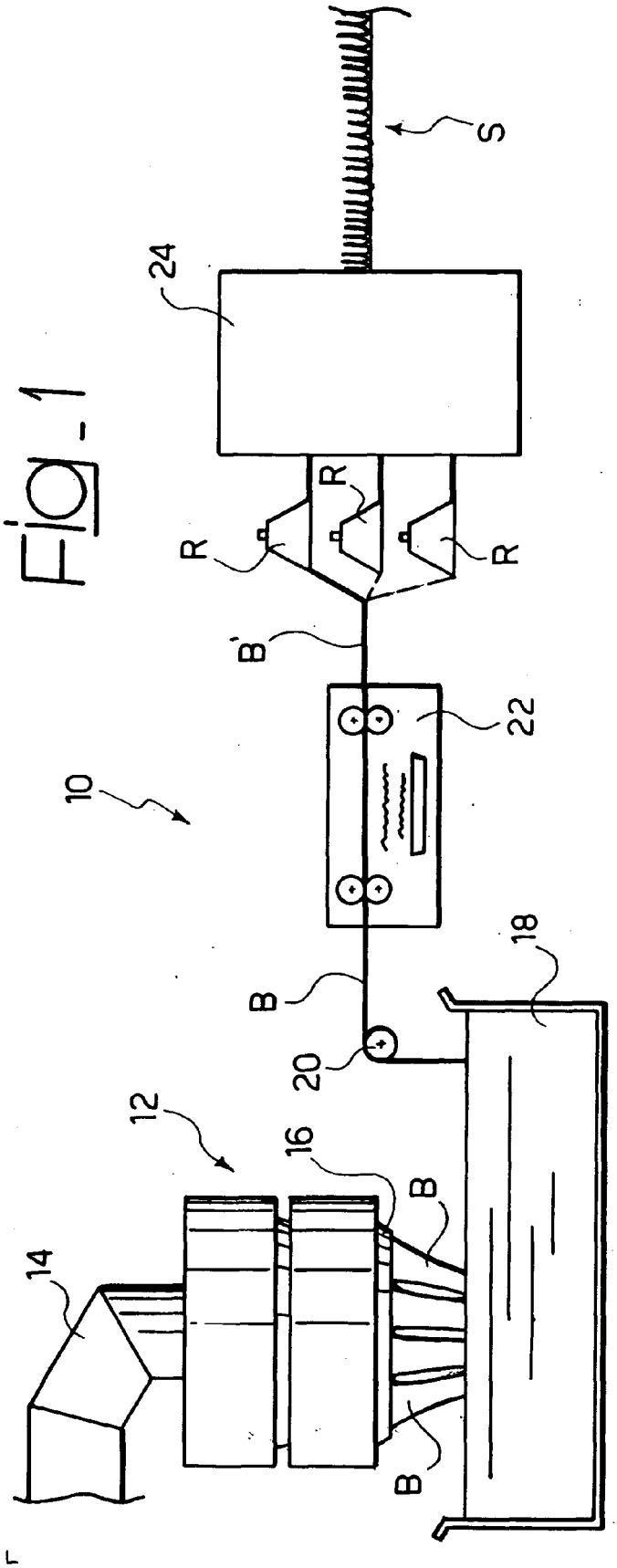
15. A process of use of a yarn according to any one of Claims 1 to 9 for making a synthetic-grass covering (S), **characterized in that** it comprises the operation of subjecting said yarn (B') to stress so as to separate the filiform segments (B1') of said plurality from one another by breaking said thin connection portions (B2'), so that said separated filiform segments (B1') constitute filiform formations reproducing the grassy sward of natural turf.

16. The process according to Claim 15, **characterized in that** said operation of subjecting said yarn (B') to stress comprises the operation of subjecting said yarn (B') to twisting.

17. The process according to Claim 15 or Claim 16, **characterized in that** said operation of subjecting said yarn (B') to stress comprises the operation of subjecting said yarn (B') to brushing.

18. A synthetic-grass covering (S) comprising a synthetic grassy sward constituted by yarn (B') according to any one of Claims 1 to 9.

Fig_1


S
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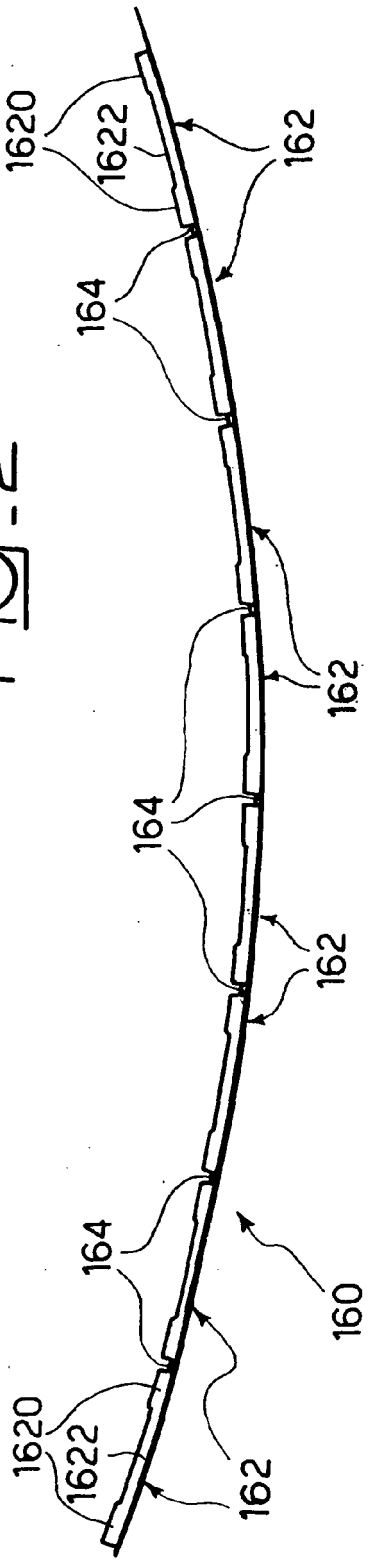
R
R
R
B'
22
10
B
18
20
12
16
B
14
B

Fig_2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1622
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164
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1620
1622
162

Fig.3

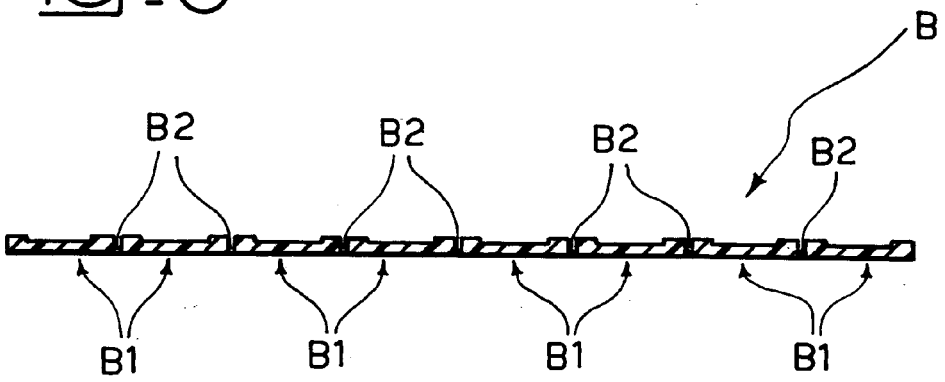


Fig.4

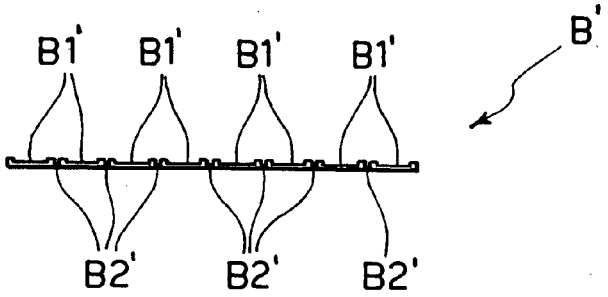


Fig.5

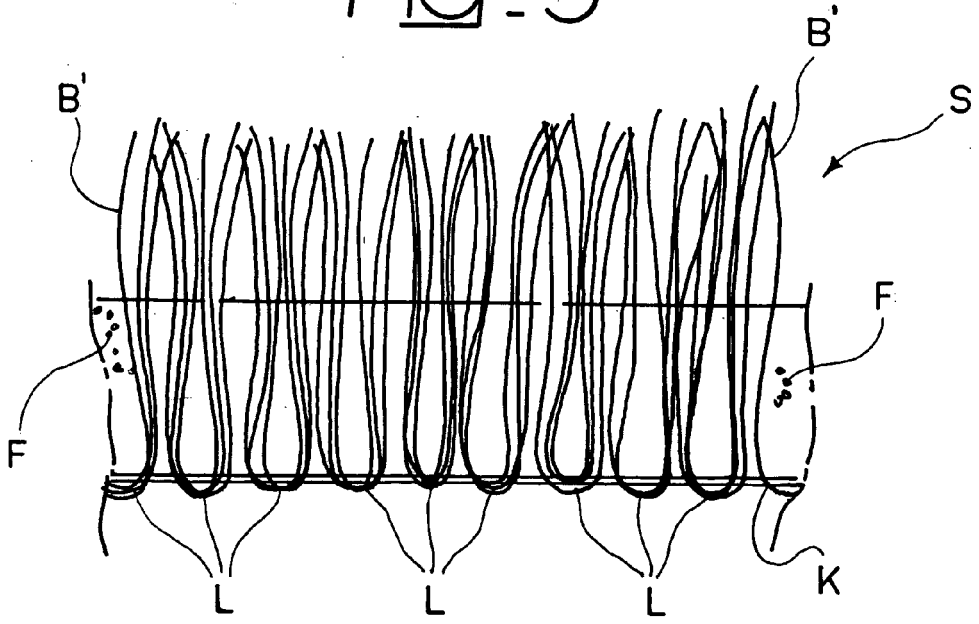


Fig_6

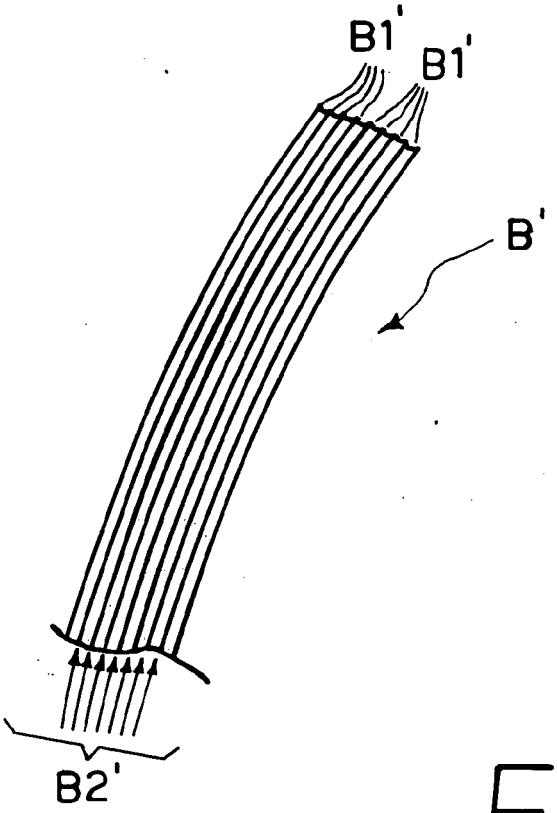
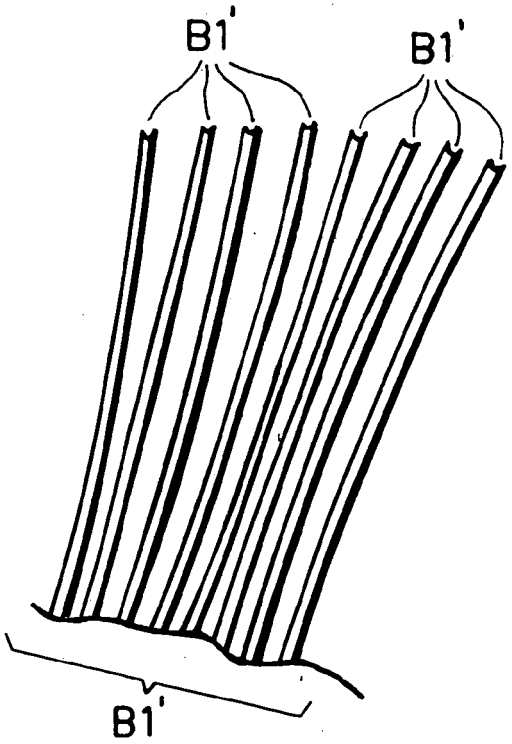


Fig_7



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Application Number
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Place of search	Date of completion of the search	Examiner
Munich	29 March 2007	Mangin, Sophie

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