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(71) Applicant (for all designated States except US): JOHN-
SON & JOHNSON INDUSTRIAL LTDA [BR/BR];
Rodovia Presidente Dutra, s/n°, KM 154, 12240-906 São
José dos Campos - SP (BR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): SIMIONATO, Luiz,

Bellino [BR/BR]; Rua Esperança, 227/801, 12243-700
São José dos Campos - SP (BR). NETTO, Emilson,
Ismael [BR/BR]; Avenida Tereza Anselmo Massari, 447,
12328-430 Jacareí - SP (BR). FALLEIROS, Alexandre,
Petrocini [BR/BR]; Rua Oscar Coelho Laurino, 171,
12244-840 São José dos Campos - SP (BR).

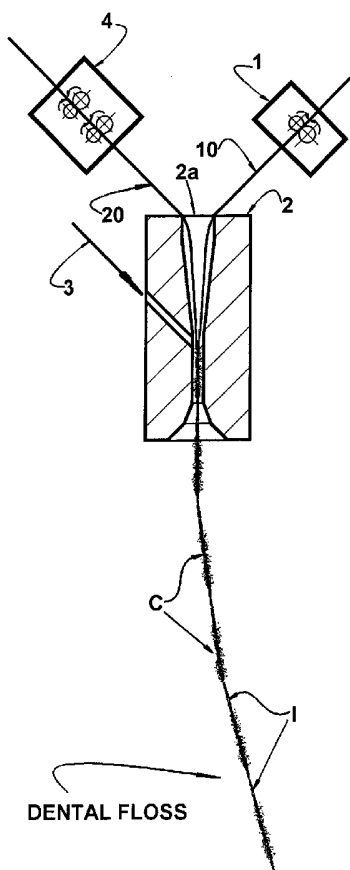
(74) Agents: ARNAUD, Antonio, M P et al.; Rua José Bonifá-
cio, 93 - 9th floor, 01003-901 São Paulo - SP (BR).

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(54) Title: DENTAL FLOSS



(57) Abstract: A dental floss that comprises at least one core yarn (10) and at least one effect yarn (20), which are formed by multiple filaments that are air jet textured and mutually interlaced, so as to form interdental insertion portions (I), which are separated from each other by cleaning portions (C) with a widened cross section. Each insertion portion (I) comprises substantially equal filament extensions of the core yarn (10) and of the effect yarn (20), whereas each cleaning portion (C) comprises filament extensions of the effect yarn (20) presenting a length that is substantially larger than the length of the filament extensions of the core yarn (10).

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European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
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DENTAL FLOSS

Field of the Invention

The present invention refers to a dental floss of the type that comprises at least one core yarn with multiple filaments and at least one effect yarn also with multiple filaments, which are aggregated to each other to form interdental insertion portions and which define, in predetermined intervals, cleaning portions provided with a cross-section that is substantially larger than that of the insertion portions.

Background of the Invention

There are well known in the art the dental flosses formed by a plurality of filaments, which are mutually aggregated with or without the aid of agglutinating agents and processed to present widened cleaning portions separated from each other by interdental insertion portions, whose length can be superior, equal or inferior to the length of the cleaning portions.

One of these known dental flosses, described in US patent 5,526,831, is produced by the melting of portions of a multi-filament yarn that are spaced from each other at predetermined intervals, this melting being generally effected by the application of a polymeric resin, which is solidified while the multi-filament yarn is maintained under certain tension. The multi-filament yarn extensions that have not been melted to each other are then expanded by treatment with heat and water vapor, for example forming widened cleaning portions that stretch when submitted to a slight tension.

This prior art solution is expensive and produces a dental floss with mutually melted filament extensions, which are transversally compacted and undesirably rigid for determined applications. These rigid

extensions impair not only the molding capacity of said dental floss, since the mutually melted filaments cannot work in relation to each other, but also its adequacy to the required softness in the contact with the gum. Besides the above disadvantage, these yarns having mutually melted filaments present the filaments of the cleaning portions united only in the end regions of the latter and allow undesirable rates of shredding to occur.

10 Another known multi-filament dental floss construction is described in US patents 4,080,777 and 4,184,316. According to the teachings of these patents, the cohesion of the multiple filaments that form the dental floss is obtained by the tangling and twisting of the filaments. According to the construction suggested in these documents, the core yarn and the effect yarn are simultaneously aspirated to the interior of an air jet tangling device, in which the multi-filament core yarn is maintained under a certain tension as it passes through the device, whereas the multi-filament effect yarn has its tension periodically relaxed to form loops of the cleaning portions. The core yarn filaments are opened by the air jet in the interior of the tangling device and interlaced with the loops formed by the open filaments of the effect yarn. After leaving the tangling device, the core yarn has its filaments approximated again or "closed", trapping the loops of the effect yarn filaments. The degree of compaction between the core yarn and the effect yarn depends on the tension applied to both yarns, and the formation of the cleaning portions is controlled by the intensity and the time of relaxation of the tension over the effect yarn.

35 In this construction proposed by the prior art, a

dental floss is obtained presenting cleaning portions produced by air jet tangling without requiring agglutinants for melting the filaments to achieve the necessary cohesion.

5 However, this solution proposed by the prior art tends to produce insertion portions in which the filaments of both the core yarn and the effect yarn are submitted to an equal or substantially equal tension, whereby the mutual interlace of the filaments is
10 insufficient to assure a safe cohesion between the core yarn filaments and the effect yarn filaments. It should be noted that in the insertion portions, in which the filaments are maintained under the same tension, the tangling produced in the composite yarn
15 has a low or practically null effect on the mutual interlace of the filaments, since said insertion portions do not receive air jet.

As a function of the production system mentioned above, the insertion portions present the filaments
20 arranged in a compact manner, but with an insufficient degree of mutual cohesion to assure a comfortable application without disaggregating in the interdental spaces.

One of the solutions to solve the problem of the
25 reduced cohesion between the filaments in the insertion portions is to use agglutinating agents generally based on natural or synthetic waxes. Another solution to this problem is proposed in said US patents 4,080,777 and 4,184,316, according to which
30 the dental floss is twisted after leaving the tangling device.

Besides requiring the application of an additional twisting operation applied to the whole dental floss, this solution produces insertion portions in which the
35 core yarn filaments and the effect yarn filaments, in

a compact arrangement, are forced to assume a helical development when twisted. Thus, said prior solution produces a dental floss with compact insertion portions presenting superficial irregularities disposed transversal to the axial displacement direction of the dental floss and which are defined by the helical development of the twisted filaments. The superficial irregularities in the compact insertion portions result in a dental floss that is "rough" in its displacement in the interdental spaces, impairing its smooth slide close to the gum and providing, with the teeth, points of friction that are potentially breakable, facilitating the occurrence of the undesirable shredding.

While being described and claimed in granted patent documents, the tangled multi-filament dental floss discussed above is not industrialized probably due to the fact of presenting insertion portions that are not sufficiently comfortable during use, besides a relatively fragile cohesion of the filaments in the insertion and cleaning portions, allowing an unacceptable degree of shredding to occur under operation.

Objects of the Invention

By reason of the deficiencies discussed above, it is a generic object of the present invention to provide a dental floss comprising multiple continuous filaments arranged in interdental insertion portions that are separated by cleaning portions with a larger cross-section, the filaments of said insertion and cleaning portions being aggregated to each other with a sufficient high degree of cohesion to minimize the rupture of the multiple filaments and the shredding of the dental floss under operation and to maximize the sliding capacity of the multiple filaments of the

insertion portions in the interdental spaces.

It is a further object of the invention to provide a dental floss such as defined above, which presents widened cleaning portions with a density of filaments
5 higher than that of the insertion portions, allowing the dental floss to present further characteristics of easy insertion in small interdental spaces, efficient drag of food debris for interdental cleaning, and softness in the contact with the gum.

10 It is a further object of the invention to provide a dental floss of the type mentioned above, which can be obtained at a relatively reduced cost.

It is a further object of the invention to provide a dental floss such as mentioned above, which allows the
15 user to identify visually and easily the insertion portions in relation to the cleaning portions, independently of the tactile or visual detection of shape differences between said insertion and cleaning portions.

20 It is still a further object of the invention to provide a dental floss as mentioned above, which presents superficially irregular cleaning portions provided with promoters of a higher deformability of the cleaning portion under operation, and with formers
25 of debris retaining zones.

Summary of the Invention

The dental floss of the present invention is of the type that comprises at least one core yarn formed by multiple filaments and at least one effect yarn also
30 formed by multiple filaments. According to the invention, the filaments are air jet textured and mutually interlaced so as to form interdental insertion portions, which are separated from each other by cleaning portions with a widened cross
35 section, each insertion portion comprising

substantially equal filament extensions of the core yarn and of the effect yarn, whereas each cleaning portion comprises filament extensions of the effect yarn presenting a length that is substantially larger than the length of the filament extensions of the core yarn.

The dental floss as defined above and obtained by the air jet texturing process presents the filaments of both the core yarn and the effect yarn mutually textured and interlaced, resulting in a dental floss with excellent characteristics of filament cohesion, making difficult the occurrence of rupture and shredding and assuring a better slide in the interdental spaces.

15 Brief Description of the Drawings

The invention will be described below, with reference to the enclosed drawings that are given by way of example of a way of carrying out the invention and in which:

20 Figure 1 is a flowchart of a simplified process, illustrating the arrangement of the filaments of the core yarn and of the effect yarn in relation to each other and to the basic means that are used in the production of the dental floss;

25 Figure 2 is an enlarged plan view of the dental floss constructed according to the present invention, illustrating a possible configuration for the widened cleaning portions; and

30 Figure 3 is a view similar to that of figure 2, but illustrating another possible exemplary configuration for the cleaning portions.

Detailed Description of the Invention

As previously mentioned and illustrated in figure 1 of the enclosed drawings, the present dental floss is of the type that comprises at least one core yarn 10

formed by multiple filaments and at least one effect yarn 20 also formed by multiple filaments. The filaments of the core yarn 10 and of the effect yarn 20 can be obtained from cotton, silk, nylon, polyethylene, polypropylene, polyester, acrylic fibers or from several mixtures of these materials, said filaments presenting cross section dimensions that are adequate to form the dental floss and which vary as a function of the material employed and of the more specific application intended for the dental floss.

For the formation of the present dental floss, at least one core yarn 10 made of multiple continuous filaments is fed from a supply unit 1 to a texturing unit 2 using an air jet 3 and which is provided with a longitudinal channel 2a, through which the multi-filament core yarn 10 is forced to pass by action of the suction produced by the air jet 3 supplied to the texturing unit 2.

The supply of the core yarn 10 through the texturing unit 2 is controlled by the supply unit 1 so as to be maintained in a feed rate that is sufficient to allow the multiple filaments of the core yarn to be mutually expanded and consequently separated by incidence of the air jet 3 and to be taken to a condition of loss of linearity, with the formation of undulations of controlled dimensions. This known prior art procedure utilizes an output speed of the core yarn 10 that is adequately lower than the first feed rate, and the difference between the quantity of filaments of the core yarn 10 that are fed and the quantity of the filaments being discharged from the texturing unit 2 corresponds to the quantity required to form the undulations in the filaments of the core yarn 10. The texturing unit 2 also receives from a control unit 4 at least one effect yarn 20 having multiple filaments.

The supply of the effect yarn 20 is also made pneumatically and at variable speeds, which are determined by the control unit 4 presenting a suitable construction, such as for example the constructions suggested by the Heberlein Company.

The control of the feed rate of the effect yarn 20 by the control unit 4 allows the dental floss being produced to present insertion portions I separated from each other by cleaning portions C with a widened cross-section, according to different patterns determined as a function of the desired dental floss project.

In order to form the insertion portions I dimensioned for the introduction of the dental floss in the interdental spaces, the effect yarn 20 is supplied at the same feed rate as the core yarn 10.

The lowest output speed of the dental floss from the texturing unit 2 is calculated to produce, according to the intensity of air jet 3 inciding over the core yarn 10 and the effect yarn 20 inside the texturing unit 2, an insertion portion I in which the filaments of the core yarn 10 and of the effect yarn 20 are textured and mutually interlaced to produce a determined cross-section dimension with a desired density for said insertion portion I.

The length of the insertion portion I to be formed is determined by the time during which the feed rate of the effect yarn 20 is maintained equal to the feed rate of the core yarn 10. The length of each insertion portion I is determined as a function of different parameters of the dental floss project, being preferably dimensioned to lie within the range of about 3 mm to about 500 mm and the desired degree of cohesion between the filaments of the core yarn 10 and of the effect yarn is basically achieved by the air

jet texturing operation and by the difference between the input and output speeds of the filaments in the texturing unit 2.

5 Since the insertion portions I are obtained with the same feed rates for both the core yarn 10 and the effect yarn 20, each insertion portion I comprises substantially equal filament extensions of both the core yarn 10 and the effect yarn 20.

10 On the other hand, for the formation of the cleaning portions C, the feed rate of the effect yarn 20 is automatically and programmably increased by the control unit 1, so as to supply more effect yarn 20 to the texturing unit 2.

15 The increase of the feed rate of the effect yarn 20 is programmed to produce, together with the dimensional and operational characteristics of the texturing unit 2, a cleaning portion C with a widened cross-section that is generally substantially larger than that of the insertion portions I of the dental floss.

20 As already described in relation to the insertion portions I, the length of each cleaning portion C is determined by the time in which the feed rate of the effect yarn 20 is maintained at higher values than those of the feed rate of the core yarn 10, said
25 length of the cleaning portion C being preferably dimensioned to be situated within the range of about 3mm to about 500mm.

Besides contributing to increase the cross-section of the cleaning portions C, the setting of a higher feed
30 rate of the effect yarn 20 allows determining the desired density of the filaments in the cleaning portions C, it being understood that the latter comprise, in the different density conditions, filament extensions of the effect yarn 20 presenting a
35 length that is substantially larger, preferably from

one and a half time to ten times larger than the length of the filament extensions of the core yarn 10. As illustrated in figures 2 and 3, the configuration of the cleaning portions can be altered, by varying
5 the overfeed rate of the effect yarn 20 during the time in which said overfeed rate is applied.

In the embodiment of figure 2, the overfeed rate is maintained constant throughout the longitudinal extension of the cleaning portions C, which makes the
10 contour of the latter to be substantially homogeneous and present only the cross-section variations that are inherent to the air jet texturing process.

In the embodiment of figure 2, the overfeed rate of the effect yarn 20 is increased from the feed rate
15 value of the core yarn 10, until reaching the programmed maximum value, remaining in this value for a certain time, to be then reduced to the feed rate value of the core unit 10.

It should be further understood that the variation of
20 the overfeed rate can be effected, either more slowly or more abruptly, altering the configuration of the end regions opposite to the cleaning portions C, which may present a configuration that is substantially orthogonal to the longitudinal axis of the dental
25 floss, in case an instant variation of the feed rate of the effect yarn 20 occurs, or a substantially frusto-conical configuration, in case the variation of the feed rate of the effect yarn 20 is performed more slowly. This possible construction allows for the
30 formation of cleaning portions C that are more or less aggressive in relation to the interdental spaces inside which they are forced to penetrate in a longitudinal displacement.

In the embodiment of figure 3, the overfeed rate of
35 the effect yarn 20 is varied during the time in which

it is applied, between a minimum but still higher value than the feed rate of the core yarn 10 and a determined maximum value related to the highest cross-section value desired for the cleaning portions C and
5 which in this example is higher than that of the example of figure 2. This variation of the overfeed rate of the effect yarn 20 allows obtaining cleaning portions C that are superficially irregular enough to form superficial recesses R, which depending on the
10 intensity of the variation of the overfeed rate and of the time in which said rate is maintained in lower levels, begin to operate as promoters of a higher deformability of the cleaning portion C, and as formers of retaining zones for the debris removed from
15 the interdental spaces.

As already mentioned, the increase and the reduction of the overfeed rate can be effected, either progressively or abruptly and the time during which the overfeed rate remains in its maximum value can be
20 reduced in order to practically eliminate any extensions with a constant cross-section in each cleaning portion C. The control of the overfeed rate of the effect yarn 20 and of the time in which each overfeed rate value is maintained constant allows
25 imparting different cross-section contours to the cleaning portions C.

The thus obtained dental floss may receive the application of an impregnating carrier defined by a waxy material selected from the group consisting of
30 animal waxes, mineral waxes, vegetal waxes, synthetic waxes, and mixtures thereof, preferably colorless or white and which are maintained in a solid state at temperatures lower than about 65°C. Suitable waxes to form the impregnating carriers include beewax,
35 paraffin, microcrystalline waxes, polyethylene

glycols, resins and wax type polymers, and mixtures thereof, which are capable to increase the cohesion degree of the textured and interlaced filaments and to provide an adequate lubrication of the dental floss, particularly of the insertion portions I that will be introduced and slid in the interdental spaces.

The impregnating carrier, which is aggregated to the dental floss by any adequate process, such as those which include passing the dental floss continuously through a bath of the impregnating carrier, generally carries one or more active agents, such as germicides, therapeutic agents, flavorants, sweeteners, abrasives, and the like, having not only therapeutic functions but also of oral hygiene, by means of a product with a pleasant taste and odor.

As germicides and therapeutic agents one can mention triclosan, chlorhexidine, sodium laurylsulfate, cetylpyridinium chloride, benzalkonium chloride, benzothonium chloride, and other ammonia quaternaries, zinc chloride, and other zinc salts, eucalyptol, thymol, menthol, methylsalicate and other essential oils, as well as other compounds that can be used as antiseptic agents.

The conventionally used flavorants are mint, cinnamon, menthol, peppermint, cassia, gaultheria, and the like. Suitable sweeteners are sucrose, saccharin, cyclamates, aspartame, xylitol, and the like, which are used in anti-carries preparations.

A suitable abrasive is silica, which may be present in variable amounts, such as 2-15% by weight based on the total weight of the impregnating carrier.

The dental floss of the present invention can be formed from a core yarn 10, whose filaments have a different color from that of the filaments of the effect yarn 20, so as to make the higher density of

the filaments of the effect yarn 20 in the cleaning portions C to give the latter a color that is different from that obtained in the insertion portions I, which color can be even more enhanced with the application of one or more impregnating carriers.

The different colors of the cleaning portions C and of the insertion portions I allows the user to visually identify them more easily, not depending on the visual and tactile perceptions to perceive the shape differences of said portions, facilitating the correct use of the insertion portions I, in order to avoid discomfort during utilization of the dental floss.

Although only some basic forms for producing the dental floss by the interlacing, through an air jet texturing process, of multiple filaments of at least one core yarn and one effect yarn have been described, it should be understood that different arrangements of insertion portions I and cleaning portions C may be produced, without departing from the constructive concept defined in the claims that accompany the present descriptive specification.

CLAIMS

1. A dental floss that comprises at least one core yarn (10) formed by multiple filaments and at least one effect yarn (20) which is also formed by multiple filaments, characterized in that said core yarn (10) and said effect yarn (20) have their filaments air jet textured and mutually interlaced, so as to form interdental insertion portions (I), which are separated from each other by cleaning portions (C) with a widened cross section, each insertion portion (I) comprising substantially equal filament extensions of the core yarn (10) and of the effect yarn (20), whereas each cleaning portion (C) comprises filament extensions of the effect yarn (20) presenting a length that is substantially larger than the length of the filament extensions of the core yarn(10).
2. The dental floss of claim 1, characterized in that the filament extensions of the effect yarn (20) in the cleaning portions (C) are from one time and a half to ten times larger than the filament extensions of the effect yarn (20) in the insertion portions (I).
3. The dental floss of claim 1, characterized in that the cleaning portions (C) present a length from about 3mm to about 500mm.
4. The dental floss of claim 1, characterized in that the insertion portions (I) present a length from about 3mm to about 500mm.
5. The dental floss of claim 1, characterized in that the filaments of the core yarn (10) and of the effect yarn (20) are selected from cotton, silk, nylon, polyethylene, polypropylene, polyester, acrylic fibers, and mixtures of these materials.
6. The dental floss of claim 1, characterized in that it is impregnated with a carrier carrying at least one of the active agents selected from germicides,

therapeutic agents, sweeteners, flavorants, and abrasives.

7. The dental floss of claim 6, characterized in that the impregnating carrier comprises a waxy material
5 selected from the group consisting of animal waxes, mineral waxes, vegetal waxes, synthetic waxes, and mixtures thereof.

8. The dental floss of claim 1, characterized in that the cleaning portions (C) are superficially irregular,
10 containing recesses (R) that form debris retaining zones.

9. The dental floss of claim 1, characterized in that the cleaning portions (C) are superficially irregular, containing recesses (R) that promote a higher elastic
15 deformability of the cleaning portions (C).

10. The dental floss according to any one of the previous claims, characterized in that the multiple filaments of the core yarn (10) present a distinct
20 color from that of the multiple filaments of the effect yarn (20).

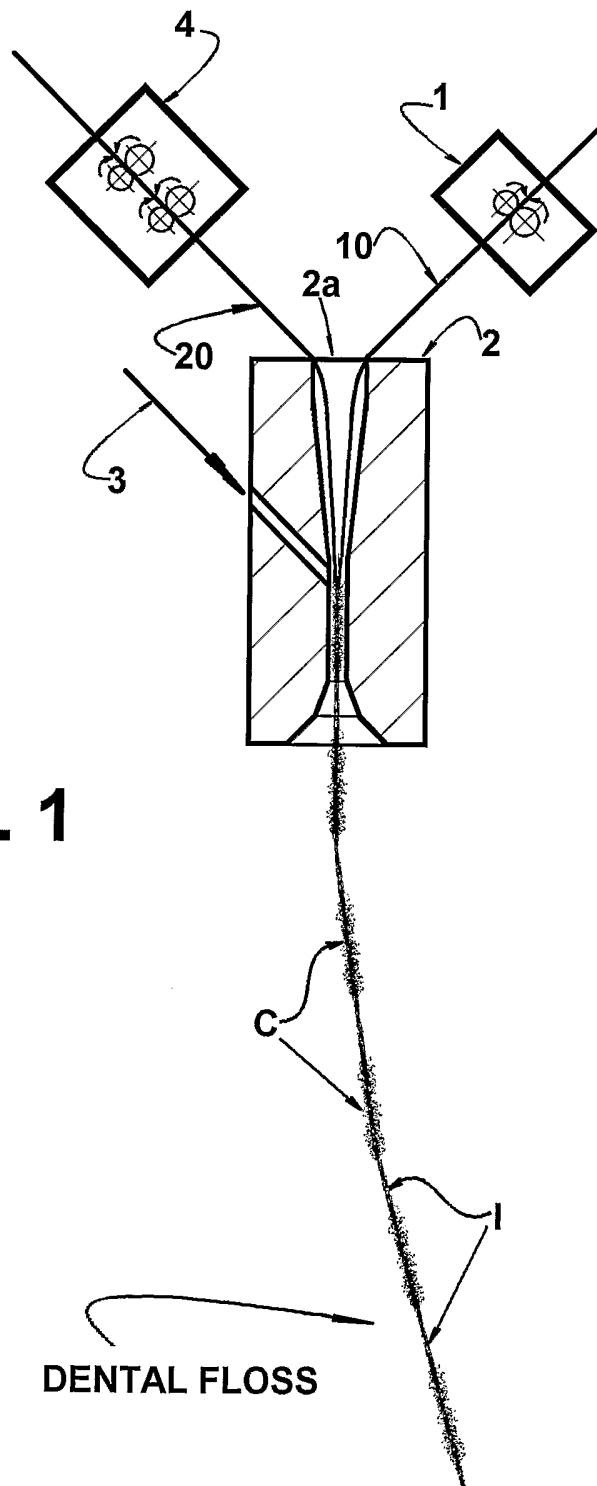


FIG. 1

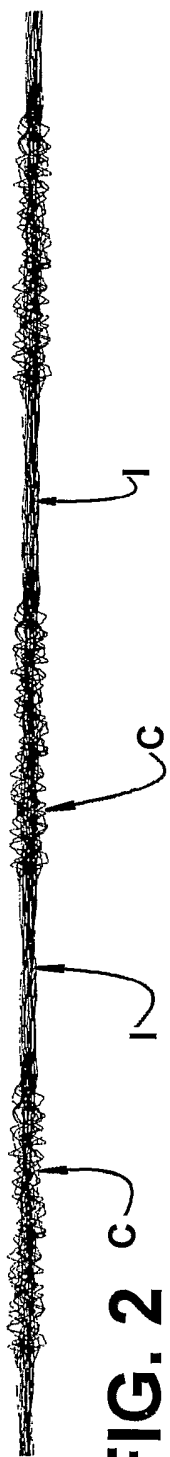


FIG. 2

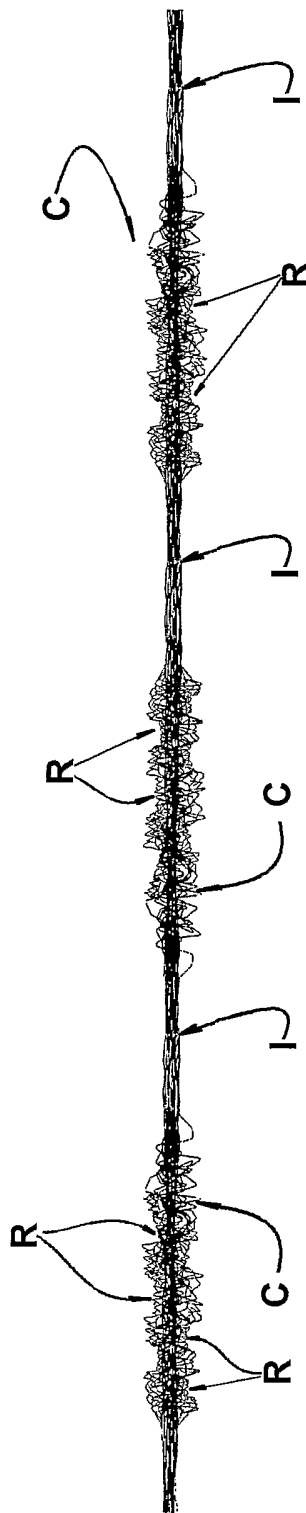


FIG. 3

INTERNATIONAL SEARCH REPORT

Intern: al Application No
PCT/BR 03/00148

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61C15/04 D02G3/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61C D02G A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 5 056 200 A (SCHWARTZ NATHAN G ET AL) 15 October 1991 (1991-10-15) abstract; figures	1-5,8-10
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search

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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Fouquet, M

INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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