

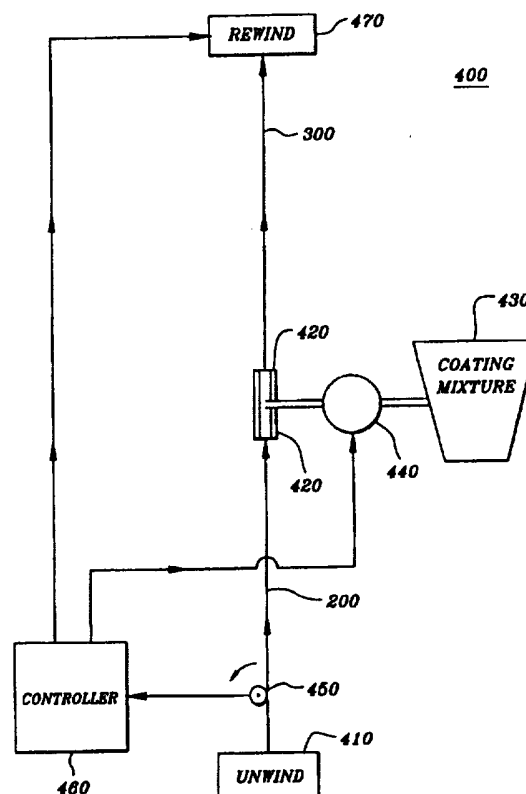


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(54) Title: DENTAL FLOSS WITH INCREASED LOADING WEIGHT**(57) Abstract**

A dental floss product and a method for making the same. A texturized dental floss substrate having a plurality of strands is provided. Each of the strands is formed from a plurality of individual filaments. At least one of the strands in the substrate contains filaments which were curled, looped, twisted, bent or crimped prior to their incorporation into a strand. The texturized dental floss substrate has an indefinite length, a cross section perpendicular to the length, an exterior surface, and a depth defined as the distance from the exterior surface toward the center of the cross section. The texturized dental floss substrate also has a substrate weight and an overcoating applied to the exterior surface. The overcoating is formed of a carrier and at least one adjuvant, and has a weight which exceeds 10 % of the substrate weight. The concentration of the overcoating decreases in a direction from the outer surface of the floss toward the interior, i.e., the concentration of the overcoating is greater at the exterior of the coated floss and lesser in the interior region thereof.



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5 DENTAL FLOSS WITH INCREASED LOADING WEIGHTField of the Invention

10 The present invention relates generally to oral hygiene. More specifically, the present invention relates to an improved dental floss product which has been loaded around its exterior surface with an increased quantity of a coating material.

Background Of The Invention

15 Dental floss is typically formed from a nylon multifilament material substrate coated with various substances and adjuvants. The weight of the floss coating (also referred to as the floss loading) typically does not exceed 55% of the substrate weight.

20 For example, the mint waxed dental floss product currently sold by Johnson & Johnson has a coating consisting of microcrystalline wax and mint flavor powder, the combination of which equals 35% of the weight of the multi-filament substrate. Similarly, the

25 waxed baking soda dental floss product and the waxed fluoride dental floss product currently sold by Johnson and Johnson have loadings which equal 54% and 40%, respectively, of the base floss weight.

30 It is desirable to maximize the percentage of dental floss loading because, among other things, increased loading generally allows more adjuvants such as

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5 fluoride, baking soda, or flavorings to be delivered
with the dental floss product, thereby giving the
product greater consumer appeal. Until recently, it was
believed that, if the dental floss loading began to
10 exceed about 50-55% of the base floss weight, the dental
floss would become undesirable from a user standpoint,
be unmanufacturable and have dispensability problems.
U.S. Patent Nos. 5,098,711 and 5,165,913, both to Hill
et al., disclose dental flosses comprising a plurality
15 of strands of, e.g., nylon, each of said strands
comprising a plurality of individual nylon
monofilaments. The Hill et al. patents taught that
satisfactory dental flosses could be manufactured having
loadings up to 100% of the substrate weight. These
20 patents to Hill et al. taught that the floss loading
weight could be extended beyond previous limits by
positioning a cleaning preparation throughout the
interior of the floss. More particularly, the patents
to Hill et al. taught the deposition of a cleaning
25 preparation in spaces between the several strands and
between the individual filaments comprising each strand.
The cleaning preparation activates as the floss splays
upon being pulled between the teeth, thereby delivering
the cleaning preparation to the oral cavity, especially
30 the surfaces of the teeth. The manufacture of the Hill
et al. floss is complicated by the requirement that the
several strands and the individual filaments in the
strands be drawn apart and/or separated at the time that
the cleaning preparation is being loaded into the floss.

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5 It is an object of the present invention to provide a floss with an increased loading percentage which approaches or even exceeds the loading percentages taught by the Hill et al. patents.

10 It is a still further object of the present invention to provide a coating which can be easily loaded onto a floss substrate, but which does not necessarily require the individual filaments and strands in the floss to be drawn apart and/or separated at the time that the floss is loaded.

15 These and other objects and advantages of the invention will become more fully apparent from the description and claims which follow or may be learned by the practice of the invention.

Summary Of The Invention

20 The present invention is directed to a dental floss product and a method for making the same. A texturized dental floss substrate having a plurality of strands is provided. Each of the strands is formed from a
25 plurality of individual filaments. At least one of the strands in the substrate contains filaments which were curled, looped, twisted, bent or crimped prior to their incorporation into a strand. The texturized dental floss substrate has an indefinite length, a cross-
30 section perpendicular to the length, an exterior surface, and a depth defined as the distance from the

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5 exterior surface toward the center of the cross-section.
The texturized dental floss substrate also has a
substrate weight and an overcoating applied to the
exterior surface. The overcoating is formed of a
carrier and at least one adjuvant, and has a weight
10 which exceeds 10% of the substrate weight. The
concentration of the overcoating decreases in a
direction from the outer surface of the floss toward the
interior, i.e., the concentration of the overcoating is
greater at the exterior of the coated floss and lesser
15 in the interior region thereof.

Brief Description Of The Drawings

In order that the manner in which the above-recited and
other advantages and objects of the invention can be
understood and appreciated, a more particular
20 description of the invention briefly described above
will be rendered by reference to a specific embodiment
thereof which is illustrated in the appended drawings.
Understanding that these drawings depict only a typical
embodiment of the invention and are not therefore to be
25 considered limiting of its scope, the invention and the
presently understood best mode thereof will be described
and explained with additional specificity and detail
through the use of the accompanying drawings.

Figure 1 is a scanning electron micrograph (SEM) showing
30 at 100 times magnification a side view of a texturized
dental floss substrate used for forming an improved

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5 dental floss product having an increased loading weight,
in accordance with a preferred embodiment of the present
invention.

Figure 2 is an SEM showing at 250 times magnification a
cross-sectional view of the texturized dental floss
10 substrate shown in Figure 1.

Figure 3 is an SEM showing at 500 times magnification a
further cross-sectional view of the texturized dental
floss substrate shown in Figure 1.

Figure 4 is an SEM showing at 100 times magnification a
15 side view of a texturized dental floss substrate which
has been uniformly loaded throughout its cross-section
with a cleaning preparation.

Figure 5 is an SEM showing at 250 times magnification a
cross-sectional view of the dental floss substrate shown
20 in Figure 4.

Figure 6 is an SEM showing at 100 times magnification a
side view of a texturized dental floss substrate which
has been uniformly loaded throughout its cross-section
with a cleaning preparation and then overcoated about
25 its exterior with an overcoating composition, in
accordance with a preferred embodiment of the present
invention.

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5 Figure 7 is an SEM showing at 500 times magnification a cross-sectional view of the texturized dental floss product shown in Figure 6.

10 Figure 8 is an SEM showing at 250 times magnification a further cross-sectional view of the dental floss product shown in Figure 6.

Figure 9 shows a system for applying an overcoating to an exterior surface of a dental floss substrate, in accordance with a preferred embodiment of the present invention.

15 Figure 10 shows a system for applying an overcoating to an exterior surface of a dental floss substrate, in accordance with an alternative preferred embodiment of the present invention.

Description Of Preferred Embodiments

20 Referring now to Figure 1, there is shown an SEM illustrating a side view of a texturized dental floss substrate 100 used for forming an improved dental floss product having an increased loading weight. Texturized dental floss substrate 100 is formed of a plurality of
25 strands. Each such strand is made of a plurality of individual filaments (or monofilaments) 110. Monofilaments 110 may be formed from polymers such as nylon 6 and 66, rayon, polyester, acetate polymers, polyolefins such as polypropylene, as well as cotton,

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5 wool and other staple yarns. Typically, monofilaments
110 have denier ranging from about 0.5 to about 6.0.
"Denier" is the weight in grams of 9000 meters of
material. Hence, a monofilament which is 9000 meters
long and weighs one gram is a "1-denier" monofilament.
10 Similarly, a strand (which, as mentioned above,
comprises a plurality of monofilaments) which is 9000
meters long and weighs one hundred grams is a "100-
denier" strand. The number of strands comprising floss
substrate 100 will vary depending, e.g., on the denier
15 which is desired for the floss substrate, the number of
monofilaments per strand, and the denier of the
individual monofilaments. For example, if it is desired
to provide a floss substrate 100 having a denier of
1200, the floss substrate might consist of a dozen (12)
20 strands wherein each strand consists of one hundred
monofilaments 110 each having a denier of 1.
Alternatively, e.g., a 1200 denier floss substrate could
as well consist of eight strands, each of said strands
consisting of seventy-five monofilaments 110 each having
25 a denier of 2. Other such combinations useful for
dental floss substrates will be readily apparent to
those skilled in the art. If desired, some or all of
the filaments 110 can be colored utilizing any suitable
dye such as FD&C Green No. 3, FD&C Red No. 40 or
30 mixtures of these or other similar dyes.

Prior to combining individual filaments 110 into a
strand, at least some, and preferably all of the
individual filaments 110 are subjected to a

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5 "texturizing" process which imparts curls, loops, twists, bends, crimps and turns to the filaments 110. The filaments 110 are texturized by disturbing the surface of the individual filaments to enable the filaments to better hold coatings loaded thereon. The
10 preferred texturized filaments 110 have a permanent curl, loop, twist, bend, crimp or turn. Several texturization processes which disturb the filament surface can be used to form texturized filaments 110. For example, individual filaments 110 may be texturized
15 by moving such filaments past an air nozzle which aims hot air at the filaments, or by curling the filaments under heat and then releasing the filaments. Suitable systems and methods for texturizing yarns or filaments are disclosed in Carrol-Porczynski, Charles Z., "Manual
20 of Man-Made Fibers, Their Manufacture, Properties, and Identification," Chemical Publishing Co., Inc., New York, NY, 1961 at pp. 160-171, and Linton, George E., "The Modern Textile and Apparel Dictionary," 4th Ed., 1973, at pp. 588-592, the disclosure of both of which
25 are hereby incorporated herein by reference.

After some or all of filaments 110 have been texturized, a plurality of filaments 110 are combined together to form a "texturized" strand. Such a strand is referred
30 to as being texturized because, among other things, the curls, loops, twists, bends, crimps and turns previously imparted to the filaments 110 cause the creation of gaps or voids 120 in substrate 100. As explained more fully below, these gaps or voids 120 provide sites for holding

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5 coatings to be applied to the floss substrate. In a preferred embodiment of the present invention, each texturized strand contains about 100 to 800 individual filaments 110.

10 Once the texturized strands have been formed as described above, the texturized floss substrate 100 is formed by combining together a plurality of texturized strands. The preferred means of combining the strands is by twisting them together or by air tacking adjacent
15 strands. Such twisting of the strands results in a texturized floss substrate 100 that is more resistant to shredding and filament separation than would otherwise be achieved. However, texturized floss substrate 100 can be made with little or no twist or it can be braided as
20 in a dental tape. The twist can be from 0.0 to 6.0 turns per inch, with a preferred twist of 1.0 to 2.0 turns per inch. In a preferred embodiment of the present invention, texturized dental floss substrate 100 contains about 2 to 12 individual strands, each of said
25 strands having a denier ranging from about 50 to 300, the preferred floss substrate denier ranging as mentioned below from about 500-1600.

The tensile strength of the texturized dental floss
30 substrate 100 is preferably between 5 and 25 pounds, although higher tensile strengths are acceptable. The preferred tensile strength is about 7 to 15 pounds. A floss substrate having a tensile strength of less than 5 pounds will tend to break easily during use and would be

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5 unacceptable for dental floss, and a substrate having a
tensile strength of more than 25 pounds offers no
advantages but is less economical to manufacture. The
texturized dental floss substrate 100 may be 200-2000
denier. However, a texturized dental floss substrate of
10 500-1600 denier is preferred so as to provide a proper
hand feel for the dental floss.

After the texturized dental floss substrate 100 has been
formed as described above, this texturized substrate is
15 used to manufacture the improved dental floss product
with increased loading which is the subject of the
present application. As described below, the
manufacturing process of the present invention is
performed in two steps. In the first step, a cleaning
20 preparation is loaded uniformly throughout the cross-
section of substrate 100 by depositing the cleaning
preparation with a uniform concentration in the voids
120 throughout the cross-section of substrate 100. This
first manufacturing step results in an "intermediate
25 floss" 200 which is shown in Figures 4 and 5. In the
second manufacturing step, an overcoating is applied to
the exterior surface of the intermediate floss 200. In
contrast to the cleaning preparation, this overcoating
is distributed primarily around the exterior surface of
30 the intermediate floss, and the concentration of the
overcoating material on the floss substrate decreases as
the distance from the exterior surface of the floss
substrate toward the longitudinal centerline of the

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5 floss substrate increases. This second manufacturing step results in a final floss product 300 which is shown in Figures 6-8.

Manufacture of the Intermediate Floss

10 The step of manufacturing the intermediate floss from texturized substrate 100 is described in U.S. Patent No. 4,911,927 to Hill et al., at col. 25, line 52 through col. 27, line 37, which patent is incorporated herein in its entirety by reference. The process for making the
15 intermediate floss consists of spreading the texturized filaments 110 in texturized substrate 100, loading a cleaning preparation in a molten state between the spread floss filaments 110, and then reforming the spread filaments back to their initial positions.
20 During the loading step, sufficient mechanical and hydraulic pressure is applied to the substrate at the point of contact with the cleaning preparation to ensure that between 10 and 100 mg of the preparation is loaded into each yard of the texturized substrate 100.
25 Suitable cleaning preparations for use in manufacturing the intermediate floss are described in U.S. Patent Nos. 5,165,913 and 4,911,927 to Hill et al. In a preferred embodiment of the present invention, the cleaning preparation carried by the intermediate floss has a
30 weight equal to 5% to 120% of the weight of the texturized substrate 100.

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5 Referring now to Figures 4 and 5, there are shown side and cross-sectional views, respectively, of the intermediate floss 200 formed in accordance with the process described above. As shown more clearly in Figure 5, the cleaning preparation (indicated by
10 reference numeral 210) has a relatively uniform concentration throughout the cross-section of the intermediate floss 200.

Application of an Overcoat to the Intermediate Floss

15 The second step in the manufacture of the dental floss product of the present invention consists of applying an overcoat to the intermediate floss 200. One purpose of the overcoat is to provide oral care adjuvants, such as,
20 additional cleaning agents, flavors, antimicrobials, decay preventive materials, and the like, to intermediate floss 200. The overcoat also functions to "lock" the aforementioned cleaning preparation into the floss substrate prior to use of the final floss product.

25 The overcoat comprises at least one carrier material and at least one adjuvant useful for inclusion in oral care products such as dental floss. Carriers which are useful include paraffin wax, microcrystalline wax (MCW),
30 beeswax, polyvinyl alcohol, hydroxypropyl cellulose, water-soluble polyethylene glycol (PEG) polymers, nylon polymers, ethylene-vinyl acetate copolymers, and the like. Additional polymers which are useful as carriers are set forth hereinafter. Adjuvants which are useful

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5 include fluoride compounds such as sodium fluoride,
stannous fluoride, and sodium mono-fluorophosphate;
anti-microbials such as cetyl pyridinium chloride (CPC),
sodium bicarbonate; tetrasodium pyrophosphate; peroxides
such as calcium peroxide and sodium percarbonate;
10 nitrates such as potassium nitrate and strontium
nitrate; flavorants; flavor enhancers; colorants;
antibiotics; plaque inhibitors; polishing agents;
fillers; buffering agents, and the like. During
manufacture, the carrier is melted and thoroughly mixed
15 with one or more of the adjuvants. The molten mixture
is then applied to the intermediate floss with the
majority of the overcoating remaining on the outer
surface of the floss, where it can be readily released
upon use.

20 The preferred amount of overcoat which is applied to the
exterior surface of intermediate floss 200 varies based
on the weight of cleaning preparation which has been
loaded into the intermediate floss 200. A particular
25 preferred cleaning preparation used for the present
invention is comprised of the following by weight: 67.4%
surfactant (poloxamer 407), 10.0% coating (silicone 1500
AF), 15.0% dicalcium phosphate, 0.2% EDTA, 0.1%
propylgallate, 2.3% insoluble saccharin and 5.0% herb
30 mint flavor. In a first preferred example of the
present invention, the aforementioned preferred cleaning
preparation is used to form the intermediate floss, and
an overcoat comprised of 98% water-soluble PEG 1450 and
2% fluoride is used to form the final dental floss

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5 product; in a second preferred example of the present
invention, the aforementioned preferred cleaning
preparation is used to form the intermediate floss, and
an overcoat comprised of 75% water-soluble PEG 1450 and
25% baking soda is used to form the final dental floss
10 product. In the two preferred examples mentioned
immediately above, the weight of the cleaning
preparation carried by the dental floss substrate is
about 50% of the weight of the base texturized floss
substrate 100, and the weight of the overcoating is
15 about 100% of the weight of the base texturized
substrate 100. In accordance with further embodiments,
set forth in Table I below are preferred overcoat weight
ranges corresponding to several different intermediate
floss loading levels. All the weights expressed in
20 Table I below are relative weights that are expressed as
a percentage of the weight of the texturized substrate
100 used to form the intermediate floss.

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5

TABLE I

Weight of Cleaning
Preparation in
Intermediate Floss

Range of Overcoating
Weight Applied to the
Exterior Surface of
Intermediate Floss

10%	30-100%
20%	25-95%
30%	25-90%
40%	20-85%
50%	20-85%
60%	15-80%
70%	15-75%
80%	10-70%
90%	10-65%
100%	10-60%
110%	10-60%
120%	10-60%

10 The polymeric carrier used to form the overcoat must have good adhesion to the intermediate floss 200 and must be non-toxic. Further, it is desirable that the polymeric material used to form the overcoat be a film former so that a uniform continuous coating can be achieved along the exterior surface of the intermediate

15 floss. It is further desirable that the polymeric carrier be capable of being hydrated by the aqueous-based fluids found in the oral cavity so as to allow for rapid release of the adjuvants in the overcoating. Finally, the polymeric overcoating is preferably clear,

20 so as to allow dyes applied to monofilaments 110 to be visible, and sufficiently abrasion-resistant to resist cracking or flaking which may result in undesirable loss of adjuvants during the latter stages of manufacture or handling prior to placement of the final dental floss

25 product in the oral cavity.

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5 Specific polymeric carriers which are useful for the
overcoat in the present invention include: alkyl
monester of poly(methyl vinyl ether/maleic acid);
polyvinyl pyrrolidones; acrylamide/acrylate/butylamino-
ethyl methacrylate polymers (polymers of this type are
10 sold by National Starch & Chemical Corporation under the
trademark "Amphomer"); vinyl acetate/crotonic acid/vinyl
neodecanoate terpolymers (terpolymeric of this type of
sold by the National Starch & Chemical Corporation under
the trademark "Resyn 28-2930"); vinyl acetate/crotonic
15 acid copolymers (copolymers of this type are sold by the
National Starch & Chemical Corporation under the
trademark "Resyn 28-1310"); and terpolyamides comprised
of the copolymerization products of three polyamide
precursors, a dicarboxylic acid-diamine reaction
20 product, a second but dissimilar dicarboxylic acid-
diamine reaction product, and a lactam (terpolymers of
this type are sold by Belding Chemical Industries as BCI
600 series nylon.)

25 Referring now to Figures 6-8, there are shown side and
cross-sectional views of the overcoated floss 300 formed
in accordance with the process described above. As
shown more clearly in Figures 7-8, the overcoat
(indicated by numeral 310) has its greatest
30 concentration at the exterior surface of floss 300, and
the concentration of material 310 decreases as the
distance from the exterior surface toward the
longitudinal centerline of the floss increases.

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5 Referring now to Figure 9, there is shown in block
diagram form a system 400 for applying an overcoating to
the exterior surface of intermediate floss 200, in
accordance with a preferred embodiment of the present
invention. A roll of intermediate floss 200 is unwound
10 at unwinding station 410. The intermediate floss 200 is
then passed through a die station 420 where the
overcoating material described above is applied
uniformly and continuously to the exterior surface of
the intermediate floss 200. Die station 420 includes a
15 groove (not shown) through which the intermediate floss
200 passes. An opening (also not shown) is provided at
the base of the groove for delivering the coating
material in a molten state into the base of the groove.
The opening in die station 420 is coupled to a heated
20 supply tank 430 by a coating pump 440. Heated supply
tank 430 maintains the coating mixture contained therein
in a molten state. As the overcoated floss exits die
station 420, the molten overcoating cools and
solidifies, and the finished floss 300 is then rewound
25 onto a supply roll at a rewind station 470.

A velocity sensor 450 is provided for monitoring the
velocity of floss passing through system 400. The
output of velocity sensor 450 is coupled to a controller
30 460. Controller 460 is also coupled to and provides
control signals to pump 440 and to rewind station 470.
The control signal provided to pump 440 ensures that,
for a given length of intermediate floss 200 passing
through die station 420, a constant and controlled

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5 amount of molten coating material is always delivered to
die station 420 and applied uniformly along the given
length of floss. The control signal provided to rewind
station 470 is provided to ensure that finished floss
300 is wound onto an output roll at the same rate that
10 intermediate floss 200 is unwound at station 410.
Finally, a tensioner (also not shown) is provided for
maintaining a tension of about 10-150g in the floss as
it moves from unwind station 410 to rewind station 470.

15 Referring now to Figure 10, there is shown in block
diagram form a system 500 for applying an overcoating to
the exterior surface an intermediate floss 200, in
accordance with an alternative preferred embodiment of
the present invention. A roll of intermediate floss 200
20 is unwound at unwinding station 510. The intermediate
floss 200 is then passed through a heated tank 520 where
the overcoating material described above is applied
uniformly and continuously in molten form to the
exterior surface of the intermediate floss 200. Heated
25 supply tank 520 maintains the coating mixture contained
therein in a molten state. Eyelet guides 530 are
provided for guiding and directing the floss through
tank 520. A die 540 is provided for removing excess
molten coating material from the floss exiting tank 520.
30 As the overcoated floss exits heated supply tank 520 and
passes through die 540, the molten overcoating cools and
solidifies, and the finished floss 300 is then rewound
onto a supply roll at a rewind station 550.

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5 A velocity sensor 560 is provided for monitoring the
velocity of floss passing through system 500. The
output of velocity sensor 560 is coupled to a controller
570. Controller 570 is also coupled to and provides a
control signal to rewind station 550. The control
10 signal provided to rewind station 550 is provided to
ensure that finished floss 300 is wound onto an output
roll at the same rate that intermediate floss 200 is
unwound at station 510. Finally, a tensioner (also not
shown) is provided for maintaining a tension of about
15 10-150g in the floss as it moves from unwind station 510
to rewind station 550.

Furthermore, it is to be understood that although the
present invention has been described with reference to a
20 preferred embodiment, various modifications, known to
those skilled in the art, may be made to the structures
and process steps presented herein without departing
from the invention as recited in the several claims
appended hereto.

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5 What is claimed is:

1. A method for forming a dental floss product,
comprising the steps of:

(A) forming a plurality of texturized filaments;

10

(B) forming a texturized dental floss substrate
from said texturized filaments, said texturized dental
floss substrate being formed of a plurality of strands
each of which is formed from a plurality of individual
15 filaments and wherein at least one of said strands
contains ones of said texturized filaments, said
texturized dental floss substrate having a length, a
cross-section perpendicular to said length, an exterior
surface, a depth defined as a distance from said
20 exterior surface toward a center of said cross-section,
and a substrate weight; and

(C) after step (B), forming said dental floss
product by applying an overcoating to said exterior
25 surface of said texturized dental floss substrate, said
overcoating being formed of a carrier and at least one
adjuvant;

30 wherein said overcoating has a weight which
exceeds 10% of said substrate weight, and wherein said
overcoating has a concentration which decreases as said
depth increases.

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5 2. The method of claim 1, said texturized dental floss substrate having an internal region distinct from and bounded by said exterior surface, further comprising the step of:

10 (D) prior to step (C), depositing a cleaning preparation in spaces between filaments positioned within said internal region, said cleaning preparation have a weight equal to 5% to 120% of said substrate weight.

15 3. The method of claim 2, wherein said dental floss product has a total loading weight representing the combination of said weight of said overcoating and said weight of said cleaning preparation, wherein said total loading weight is at least 40 percent of said substrate weight.

20

4. The method of claim 2, wherein said at least one of said strands is formed by combining one of said texturized filaments with at least one untexturized filament.

25 5. The method of claim 2, wherein said at least one of said strands is formed by combining only ones of said texturized filaments.

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5 6. The method of claim 2, wherein said texturized dental floss substrate contains from two to twelve of said strands, and wherein each of said strands contains from 100 to 800 of said individual filaments.

10 7. The method of claim 2, wherein said carrier is formed of an overcoat wax, wherein said overcoat wax is selected from the group consisting of soluble polyethylene glycol, microcrystalline wax, beeswax and paraffin wax, and wherein said at least one adjuvant is selected from the group consisting of fluoride
15 compounds, anti-microbials, tetrasodium pyrophosphate, peroxides, nitrates, flavorants, flavor enhancers, colorants, antibiotics, plaque inhibitors, polishing agents, fillers and buffering agents.

20 8. The method of claim 1, wherein said step of applying said overcoating to said exterior surface of said dental floss substrate comprises the step of pulling said dental floss substrate over a die having a cavity containing a molten overcoating mixture, and then allowing said molten overcoating mixture on said
25 texturized exterior surface to cool.

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5 9. The method of claim 1, wherein said step of applying
said overcoating to said texturized exterior surface of
said dental floss substrate comprises the step of
pulling said dental floss substrate through a bath
containing a molten overcoating mixture, and then
10 allowing said molten overcoating mixture on said
texturized exterior surface to cool.

15 10. A dental floss product, comprising: a texturized
dental floss substrate formed from texturized filaments,
said texturized dental floss substrate having a
plurality of strands each of which is formed from a
plurality of individual filaments and wherein at least
one of said strands contains ones of said texturized
filaments, said texturized dental floss substrate having
a length, a cross-section perpendicular to said length,
20 an exterior surface, and a depth defined as a distance
from said exterior surface toward a center of said
cross-section, said texturized dental floss substrate
having a substrate weight and an overcoating applied to
said exterior surface, said overcoating being formed of
25 a carrier and at least one adjuvant, wherein said
overcoating has a weight which exceeds 10% of said
substrate weight and wherein said overcoating has a
concentration which decreases as said depth increases.

30 11. The dental floss product of claim 10, said
texturized dental floss substrate having an internal
region distinct from and bounded by said exterior
surface, said dental floss product further comprising a

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5 cleaning preparation disposed in spaces between
 filaments positioned within said internal region, said
 cleaning preparation have a weight equal to 5% to 120%
 of said substrate weight.

10 12. The dental floss product of claim 11, said dental
 floss product having a total loading weight representing
 the combination of said weight of said overcoating and
 said weight of said cleaning preparation, wherein said
 total loading weight is at least 40 percent of said
 substrate weight.

15 13. The dental floss product of claim 11, wherein said
 at least one of said strands is formed of one of said
 texturized filaments combined with at least one
 untexturized filament.

20 14. The dental floss product of claim 11, wherein said
 at least one of said strands is formed of only ones of
 said texturized filaments.

25 15. The dental floss product of claim 11, wherein said
 dental floss substrate contains from two to twelve of
 said strands, and wherein each of said strands contains
 from 100 to 800 of said individual filaments.

 16. The dental floss product of claim 11, wherein said
 overcoating is formed of an overcoat wax, wherein said
 overcoat wax is selected from the group consisting of
 soluble polyethylene glycol, microcrystalline wax,

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5 beeswax and paraffin wax, and wherein said at least one
overcoat adjuvant is selected from the group consisting
of fluoride compounds, anti-microbials, tetrasodium
pyrophosphate, peroxides, nitrates, flavorants, flavor
enhancers, colorants, antibiotics, plaque inhibitors,
10 polishing agents, fillers and buffering agents.

17. A dental floss product, comprising: a texturized
dental floss substrate formed from texturized filaments,
said texturized dental floss substrate having a
plurality of strands each of which is formed from a
15 plurality of individual filaments and wherein at least
one of said strands contains ones of said texturized
filaments, said texturized dental floss substrate having
a substrate weight, an exterior surface and an internal
region distinct from and bounded by said exterior
20 surface, said texturized dental floss substrate having a
cleaning preparation disposed in spaces between
filaments positioned within said internal region and an
overcoating, distinct from said cleaning preparation,
applied to said exterior surface, said overcoating being
25 formed of a carrier and at least one adjuvant, wherein
said dental floss product has a total loading weight
representing the combination of a weight of said
overcoating and a weight of said cleaning preparation,
said total loading weight being at least 150 percent of
30 said substrate weight.

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5 18. The dental floss product of claim 17, wherein said weight of said cleaning preparation is equal to 5% to 120% of said substrate weight.

10 19. The dental floss product of claim 18, wherein said at least one of said strands is formed of one of said texturized filaments combined with at least one untexturized filament.

20. The dental floss product of claim 18, wherein said at least one of said strands is formed of only ones of said texturized filaments.

15 21. The dental floss product of claim 18, wherein said dental floss substrate contains from two to twelve of said strands, and wherein each of said strands contains from 100 to 800 of said individual filaments.

20 22. The dental floss product of claim 18, wherein said overcoating is formed of an overcoat wax, wherein said overcoat wax is selected from the group consisting of soluble polyethylene glycol, microcrystalline wax, beeswax and paraffin wax, and wherein said at least one overcoat adjuvant is selected from the group consisting of fluoride compounds, anti-microbials, tetrasodium pyrophosphate, peroxides, nitrates, flavorants, flavor enhancers, colorants, antibiotics, plaque inhibitors, polishing agents, fillers and buffering agents.

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FIG. 1



FIG. 3

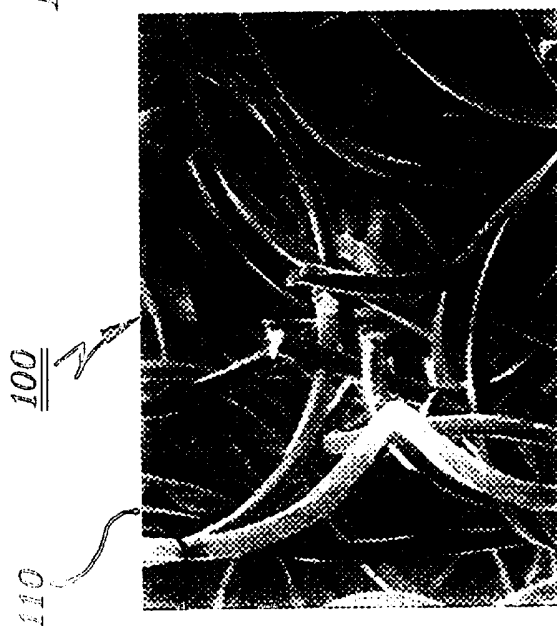


FIG. 2

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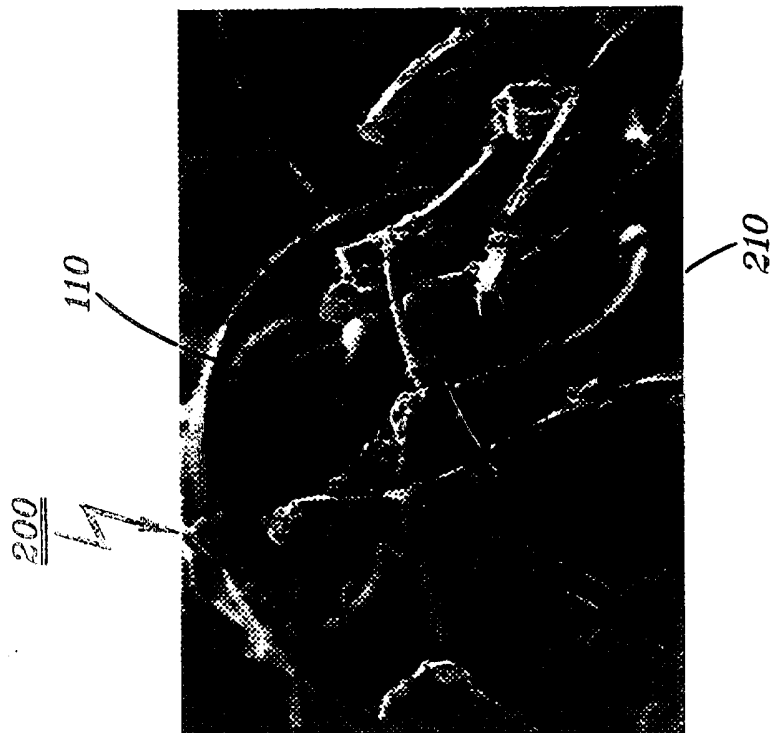


FIG. 5

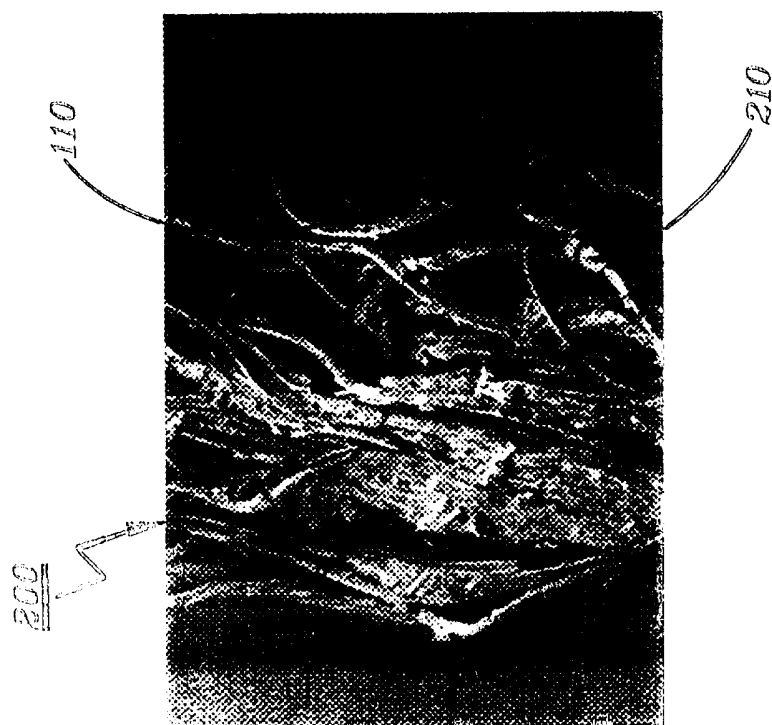


FIG. 4

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FIG. 6

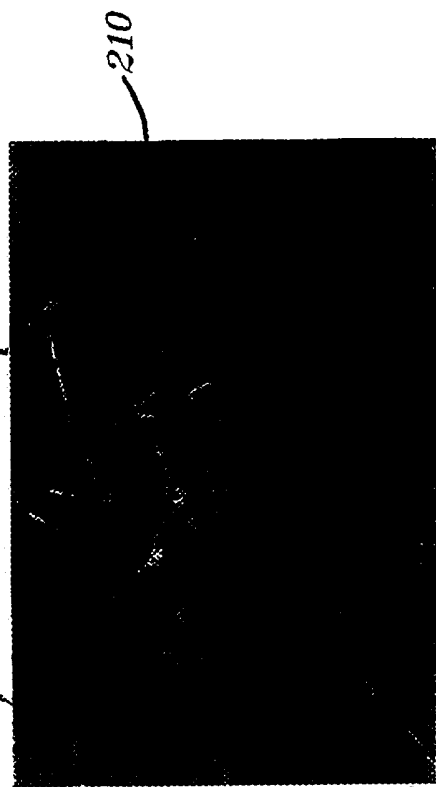
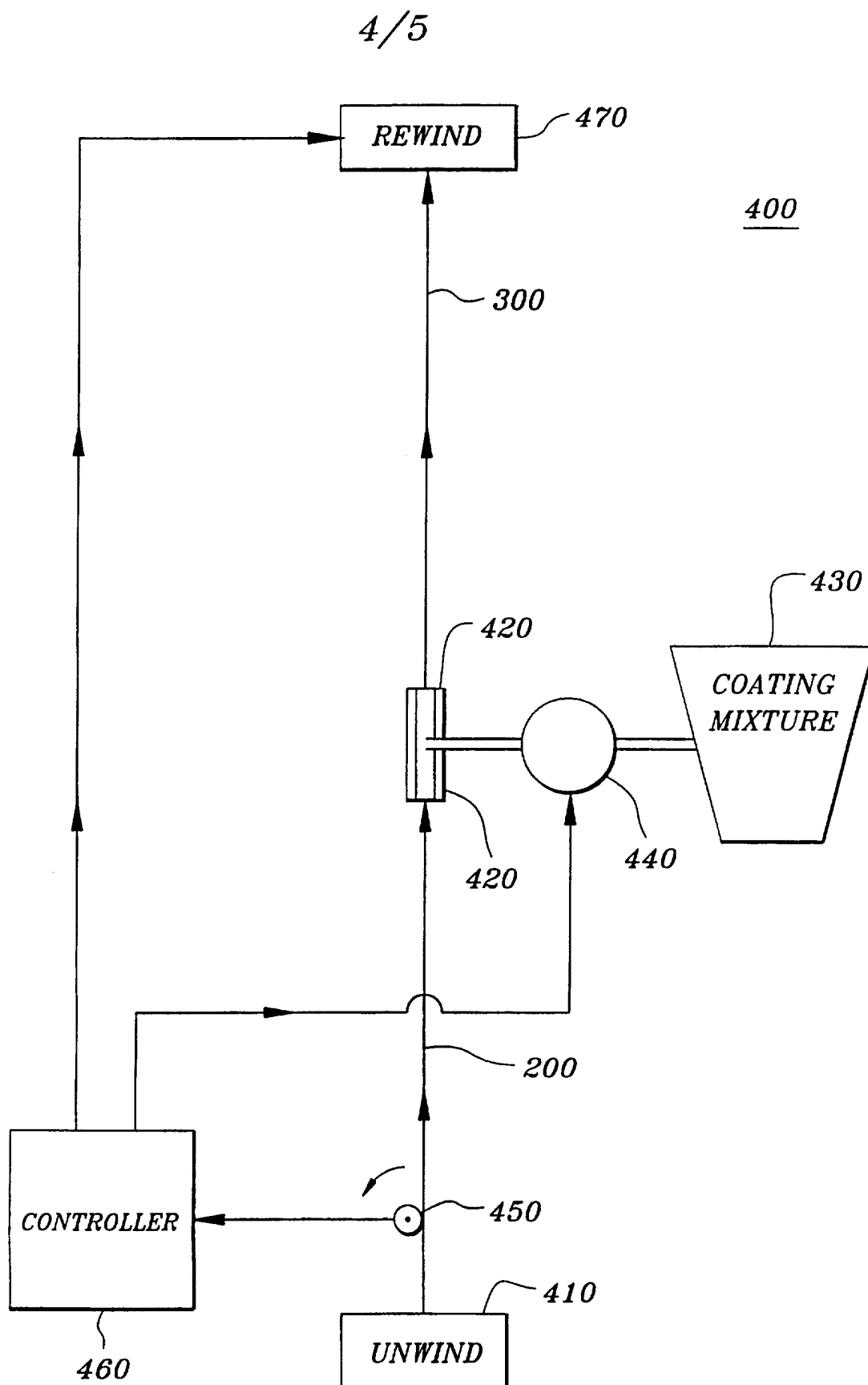


FIG. 8



FIG. 7

**FIG. 9**

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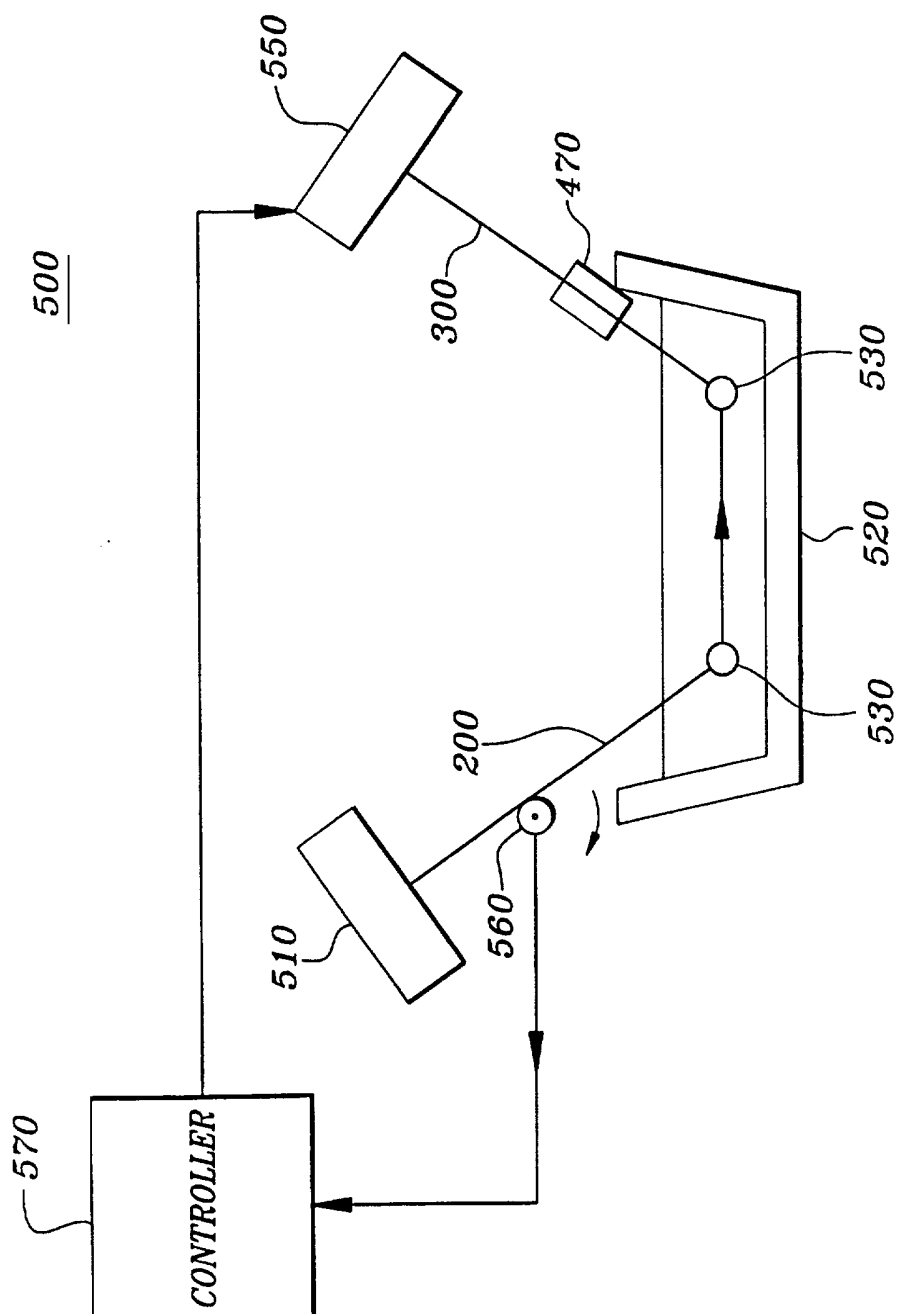


FIG. 10

INTERNATIONAL SEARCH REPORT

Internal Application No
PCT/US 97/09765

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61C15/04 A61K9/70 A61K7/16

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 6 A61C 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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 098 711 A (HILL IRA ET AL) 24 March 1992 cited in the application see column 6, line 17 - line 21 see column 11, line 67 - column 12, line 13 see column 15, line 3 - line 11 see column 18, line 46 - line 55 see column 19, line 24 - line 26 ---	1-22
A	US 3 838 702 A (STANDISH N ET AL) 1 October 1974 see column 2, line 1 - line 24 see column 2, line 33 - line 37 ---	1,10,17
A	US 2 667 443 A (ASHTON W.) 26 January 1954 see column 4, line 10 - line 26 ---	1,10,17
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

6 October 1997

Date of mailing of the international search report

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Name and mailing address of the ISA

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

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Chabus, H

INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	<p>US 5 601 775 A (CUNNINGHAM DAVID V ET AL)</p> <p>11 February 1997</p> <p>see column 3, line 34 - line 43</p> <p>see column 4, line 37 - line 40</p> <p style="text-align: center;">-----</p>	1-22

INTERNATIONAL SEARCH REPORT

Information on patent family members

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PCT/US 97/09765

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