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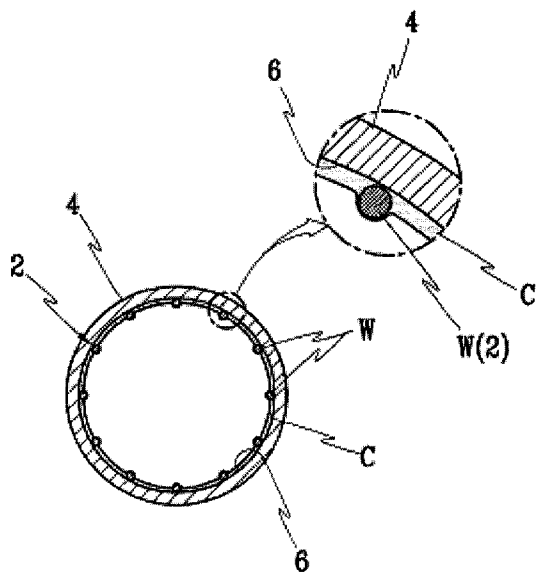
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(54) Title: STENT AND METHOD OF MANUFACTURING THE SAME



(57) Abstract: The present invention provides a stent that allows a simple surgical operation for affected parts of a lumen in a human body, and particularly reduces a medical side effect by contact or friction between the inside of the lumen and the outside of the stent when the stent is removed from the lumen. The stent includes a cylindrical wire structure having an internal passage and wires that are bent along the internal passage to have peaks and valleys, and a cover film that covers the wire structure. In particular, the cover film covers the wires such that the wires are embedded at the outside of the wire structure and exposed at the inside.

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【DESCRIPTION】**【Invention Title】****STENT AND METHOD OF MANUFACTURING THE SAME****【Technical Field】**

5 The present invention relates to a stent and a method of manufacturing the same. More particularly, the present invention relates to a stent that provides a simple surgical operation for affected parts of a lumen in a human body and particularly reduces a medical side effect by contact or friction between the inside of the lumen and the outside of the stent when the
10 stent is removed from the lumen, and a method of manufacturing the stent.

【Background Art】

 In general, the main purpose of a medical stent is to expand an affected part of a lumen in a human body that has been narrowed by disease, an external injury, or an operation.

15 Various types of stent have been known in the art, a particularly a stent that is formed by bending wires into a zigzag pattern with peaks and valleys, forming a cylindrical structure with the peaks and valleys, and coating the cylindrical wire structure with a cover film is widely used.

 The cover film prevents cancerous or fibrous tissues from permeating
20 into the cylindrical structure through the outside of the stent that is positioned in a lumen of a human body.

 The cover film is formed by inserting a cylindrical shaper into the

internal passage of the wire structure and then applying a liquid coating material onto the outside of the wire structure.

According to this application, as the coating material applied on the outside of the wire structure infiltrates between the structure and the contact
5 surface of the shaper by adhesiveness, the wires of the wire structure are embedded at the inside perimeter and exposed at the outside perimeter thereof.

Therefore, according to a stent with the cover film formed by the above application, the wires are exposed at the outside by as much as the
10 difference in thickness between the coating layer on the wires and the coating layer, i.e. the cover film formed by only the coating material itself.

However, the stent with wires exposed at the outside causes friction due to contact between the coated wires exposed outside and the inside of the lumen when it is removed out of the lumen of the human body.

15 In particular, when friction is caused when removing the stent, the inside of the lumen of the human body is damaged or pain is caused. Therefore, it is difficult to ensure sufficient safety, which may be a factor that causes medical side effects in an operation using the stent.

Further, since the wires are coated but exposed at the outside of the
20 stent, after the stent is inserted in the lumen of the human body the cellular tissues of the conduit expand into the spaces between the exposed wires by reaction, and the stent may be covered and fixed in the conduit of the lumen. Therefore, another medical side effect may be generated.

The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention and therefore it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

5 **【Disclosure】**

【Technical Problem】

 The present invention has been made in an effort to provide a stent that allows a simple surgical operation for lumens in a human body and that particularly reduces a medical side effect caused by contact or friction
10 between the inside of the lumen and the outside of the stent after the operation is completed, and a method of manufacturing the stent.

【Technical Solution】

 An exemplary embodiment of the present invention provides a stent including:

15 a cylindrical wire structure having cylindrically wound wires, each bent in a zigzag shape to have peaks and valleys; and

 a cover film covering the inside and outside of the wire structure.

 In the stent, the cover film is coated such that the outside of the cover film forms a circumferential surface that is the same as the coating surface on
20 the outside of the wires of the cylindrical wire structure.

 Another exemplary embodiment of the present invention provides a method of manufacturing a stent, including:

forming a cylindrical wire structure with an internal passage by bending wires to have peaks and valleys;

setting a shaper for coating to cover the outside of the wire structure;

coating the wire structure with a coating material while the shaper for coating having a hollow space covers the outside of the wire structure; and

forming a cover film by hardening the coating material coated on the wire structure.

【Advantageous Effects】

As described above, according to an exemplary embodiment of the present invention, it is possible to simply manufacture a stent with a cover film that covers the inside and outside of a cylindrical wire structure that is formed by winding wires.

In particular, since the cover film that is coated on the wires arranged in a zigzag pattern in a cylindrical shape around the outside of the stent such that the wires are embedded, not exposed, in the coating material, it is possible to secure improved safety in an operation while decreasing the friction generated in removing the stent from the lumen of the human body, as compared with the stents with wires exposed at the outside in the related art.

Further, when the wires are exposed at the outside of the stent after coating, they may cause damage or pain to the inside of the lumen of the human body by friction when removing the stent from the lumen. In particular, when the cellular tissues of the lumen adhere to the wires and apply a force to the stent, the stent is depressed and the lumen may be

re-narrowed.

In addition, in the stent according to the present exemplary embodiment, since one end or both ends of the cylindrical wire structure are inclined by narrowing to the center, it is possible to easily remove the stent out
5 of the lumen by preventing locking of the end(s) when removing the stent from the lumen in the human body.

【Description of Drawings】

FIG. 1 is a flow chart illustrating preferable manufacturing processes of a method of manufacturing a stent according to an exemplary embodiment
10 of the present invention.

FIG. 2 is a view showing a stent manufactured by the processes of FIG. 1.

FIG. 3 is a view illustrating forming a wire structure in the processes of FIG. 1.

15 FIG. 4 is a view illustrating forming an inclination in the processes of FIG. 1.

FIG. 5 is a view illustrating setting a shaper for coating in the processes of FIG. 1.

20 FIG. 6 is a view illustrating coating a coating material in the processes of FIG. 1.

FIG. 7 is a view illustrating distribution of the coating material after the coating of FIG. 6.

FIG. 8 is a view illustrating forming a cover film in the processes of FIG.

1.

FIG. 9 is a cross-sectional view of a stent manufactured through the processes of FIG. 1.

【Best Mode】

5 Hereinafter, preferable exemplary embodiments of the invention are described in detail with reference to the accompanying drawings. The exemplary embodiments of the present invention are described such that they can be achieved by those skilled in the art.

Therefore, exemplary embodiments of the present invention can be
10 modified into various types and the appended claims of the invention are not limited to the embodiments disclosed hereafter.

FIG. 1 is a flow chart illustrating preferable manufacturing processes of a method of manufacturing a stent according to an exemplary embodiment of the present invention, and reference numeral S1 represents forming a
15 cylindrical wire structure.

Forming a cylindrical wire structure (S1) may be achieved by a method known in the art and is not described in detail herein.

In order to form the cylindrical wire structure, though not shown in the figures, a common jig having a bar-shaped member with a plurality of
20 protrusions for bending that are formed around the outside for manufacturing a stent may be used.

In detail, the cylindrical wire structure 2 with the peaks and valleys is formed by bending the wires into a zigzag pattern using the jig (see FIG. 3).

According to the function required for the part of the lumen in the human body that is in need of an operation, the wire structure 2 may be, for example, a common elastic stent that elastically contracts/expands or maintains deformation.

5 A method of manufacturing the wire structure 2 by winding the wires W using the common jig for manufacturing a stent is widely known in the art.

Further, though not shown in the figures, the wire structure 2 may be formed in various other shapes in addition to the wires W wound as shown in FIG. 3.

10 The method of manufacturing a stent according to an exemplary embodiment of the present invention may further include forming an inclination (S1-1).

In the forming of an inclination (S1-1), when forming the wire structure 2 using a common method, that is, winding the wires W in a predetermined
15 way using a jig for manufacturing a stent, an inclination D1 may be formed such that the wire structure 2 gradually decreases in diameter at an end by narrowing the circumference L of the end of the wire structure 2 as shown in FIG. 4.,.

The inclination D1 may be formed at one end or both ends of the wire
20 structure 2.

The wire structure 2 with the inclination D1, though not shown in the figures, has the advantage of preventing locking when removing the stent from the lumen of the human body, as compared with the wire structure of a

common flare type or flat type stent in the related art.

The cylindrical wire structure 2 is set in a shaper for coating (S2).

According to the setting (S2), as shown in FIG. 5, the wire structure 2 is inserted into a hollow space 6 of the cylindrical shaper for coating 4 and set
5 at a predetermined position.

In detail, as the wire structure 2 is inserted into the hollow space 6 of the shaper for coating 4, the entire outside of the wire structure 2 is surrounded by the inside of the hollow space 6.

The inner diameter of the hollow space 6 is the same as or less than
10 the outer diameter of the wire structure 2, such that the wire structure 2, as shown in FIG. 5, is elastically inserted and fixed, maintaining the original shape.

After the setting, a coating material is applied (S3). In the coating (S3), as shown in FIG. 6, a liquid coating material C may be applied from
15 above, with the shaper for coating 4 standing as shown in FIG. 6.

The liquid coating material C may be provided to the inside of the hollow space 6 of the shaper for coating 4 using a common nozzle N. In providing the coating material, it may be possible to flow the coating material down along the entire inside of the hollow space 6 by rotating the nozzle.

20 It is preferable to supply as much coating material C as needed to cover the wires of the wire structure 2.

The liquid coating material C may be medical polyurethane, a silicone-urethane copolymer, silicone, a polyamide, polyester, or a fluorine

resin.

As the coating is performed on the wire structure 2 covered by the shaper for coating 4 as described above, the coating material C adheres even to the inside of the hollow space 6 of the shaper for coating 4 by
5 adhesiveness.

Since the outside of the wire structure 2 is in contact with the inside of the hollow space 6 of the shaper for coating 4, by the coating, a coating layer that forms a circumferential surface that is the same as the inside of the hollow space 6 is formed by the coating material C.

10 After the coating is completed, a cover film is formed (S4). The forming of the cover film (S4) may be achieved by hardening the coating material C using a common UV oven M, as shown in FIG. 8.

The shaper for coating 4 with the wire structure 2 inserted therein is fixed by a holder J1 of a placing jig J.

15 The placing jig J is disposed in the UV oven M and preferably holds the shaper for coating 4 horizontally.

The placing jig J may be configured such that the holder J1 that detachably holds the shaper for coating 4 is rotated by power from a motor J2.

Rotating the placing jig J with the motor is for preventing the liquid
20 coating material C coated on the wire structure 2 from being non-uniformly distributed while flowing down.

In detail, the cover film 8 is formed, as shown in FIG. 2, by hardening the coating layer formed in a common way by the coating material C in the UV

oven M while rotating the wire structure 2 that is horizontally fixed to the placing jig J.

Further, when the coating material C is hardened by the UV oven M, the hardening may be achieved while removing air bubbles contained in the coating material C.

For this purpose, according to the present exemplary embodiment as shown in FIG. 8, an exhaust pipe P1 connected with a common vacuum pump P communicates with the UV oven M and air bubbles contained in the coating material C are removed by vacuum pressure generated by driving the vacuum pump P.

According to the hardening under a vacuum atmosphere as described above, it is possible to easily remove the air bubbles in the coating material C coated on the wire structure 2 and prevent air bubble holes from forming on the cover film 8.

Further, since the hardening is performed while rotating the shaper for coating 4 horizontally fixed by the placing jig J under the vacuum atmosphere, it is possible to harden the infiltrated coating material C with uniformity in the space between the wires W and the contact surface of the shaper for coating 4 as well as in the space between the wires W of the wire structure 2.

Therefore, the stent D with the integral cover film 8 covering the inside and outside of the wire structure 2 as shown in FIG. 2 is manufactured by the above processes.

In particular, in the processes, since the coating material C is applied

onto the shaper for coating 4 covering the outside of the wire structure 2, as shown in FIG. 9, it is possible to form the cover film 8 with the wires W embedded, not exposed, around the outside of the stent D by the coating material C. That is, the outside of the wire structure 2 has the cover film 8
5 that has the same circumferential surface as the outside of the wires W.

Further, although not shown in the drawings, the stent D may further have a common lasso for surgical operation.

A thread or string that does not cause a side effect to the human body may be used for the lasso for surgical operation and may be connected in a
10 way known in the art to a narrow end of the stent D by pulling.

【CLAIMS】**【Claim 1】**

A stent comprising:

a cylindrical wire structure having cylindrically wound wires, each bent
5 in a zigzag pattern to have peaks and valleys; and
a cover film covering the inside and outside of the wire structure,
wherein the cover film is coated such that the outside of the cover film
forms a circumferential surface that is the same as the coating surface on the
outside of the wires of the cylindrical wire structure.

10 **【Claim 2】**

The stent of claim 1, further comprising

an inclination,

wherein the inclination is formed by narrowing an end of the wire
structure toward the center.

15 **【Claim 3】**

The stent of claim 1, wherein the cover film is made of one of medical
polyurethane, a silicone-urethane copolymer, silicone, a polyamide, polyester,
and a fluorine resin.

【Claim 4】20

A method of manufacturing a stent, comprising:

forming a cylindrical wire structure with an internal passage by
bending wires to have peaks and valleys;

setting a shaper for coating to cover the outside of the wire structure;
coating the wire structure with a coating material while the shaper for
coating having a hollow space covers the outside of the wire structure; and
forming a cover film by hardening the coating material coated on the
5 wire structure.

【Claim 5】

The method of claim 4, further comprising
forming an inclination to the wire structure,
wherein the inclination is formed by narrowing an end of the cylindrical
10 wire structure toward the center when forming the wire structure.

【Claim 6】

The method of claim 4, wherein the setting of the shaper for coating is
to set the wire structure in the hollow space of the shaper for coating such that
the outside of the wire structure is covered by the inside of the hollow space.

15 **【Claim 7】**

The method of claim 4, wherein the forming of the cover film is to
apply the coating material through the hollow space of the shaper for coating.

【Claim 8】

The method of claim 4, wherein the forming of the cover film is to
20 harden the coating material coated on the wire structure in a UV oven.

【Claim 9】

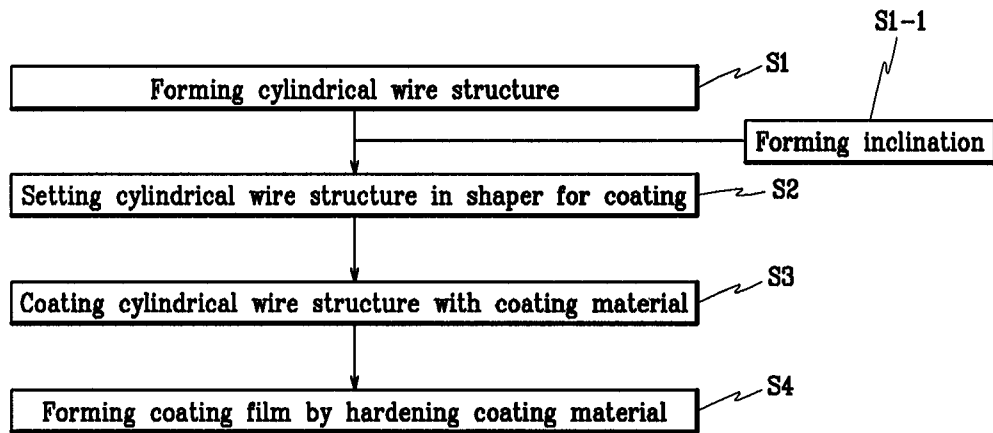
The method of claim 4, wherein the forming of the cover film is to

harden the coating material while rotating the wire structure that is horizontally fixed to a placing jig around the center.

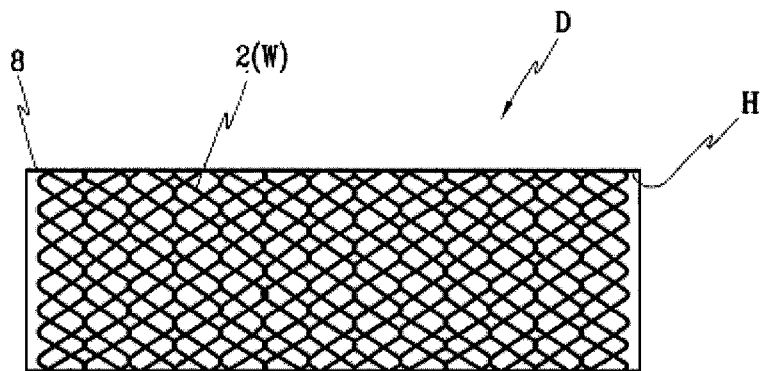
【Claim 10】

The method of claim 4, wherein the forming of the cover film is to
5 harden the coating material under a vacuum atmosphere in the UV oven,
using vacuum pressure formed by a vacuum pump.

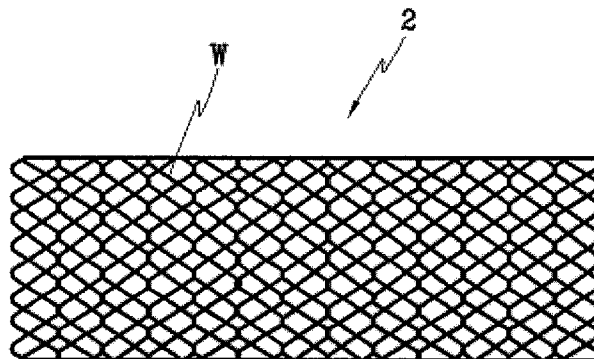
【FIG. 1】



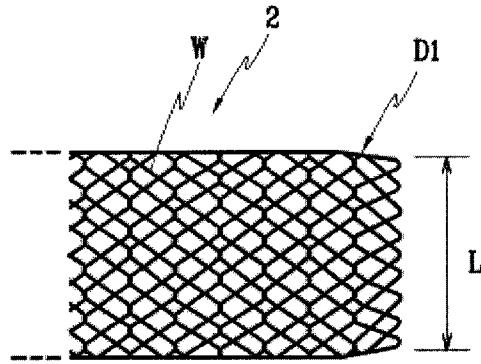
【FIG. 2】



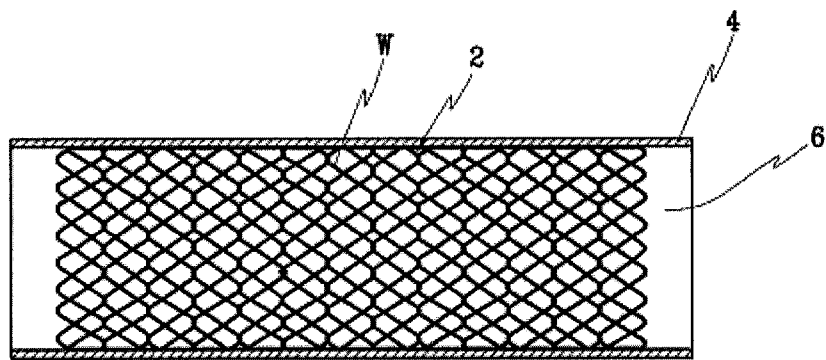
【FIG. 3】



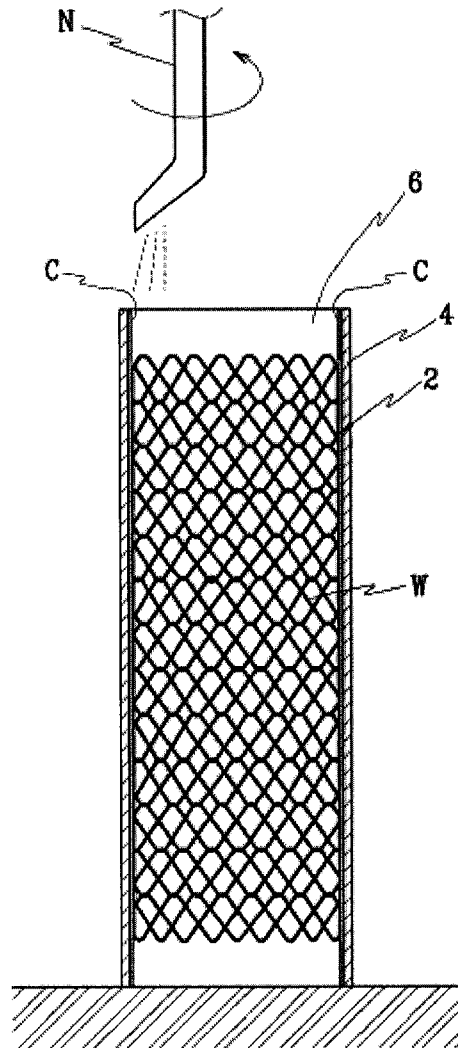
【FIG. 4】



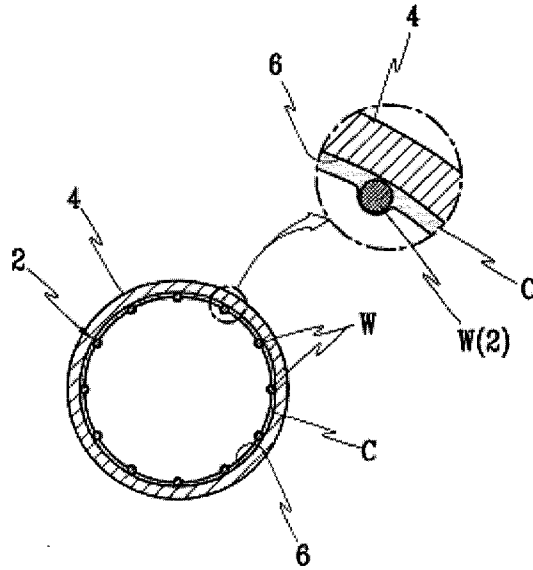
【FIG. 5】



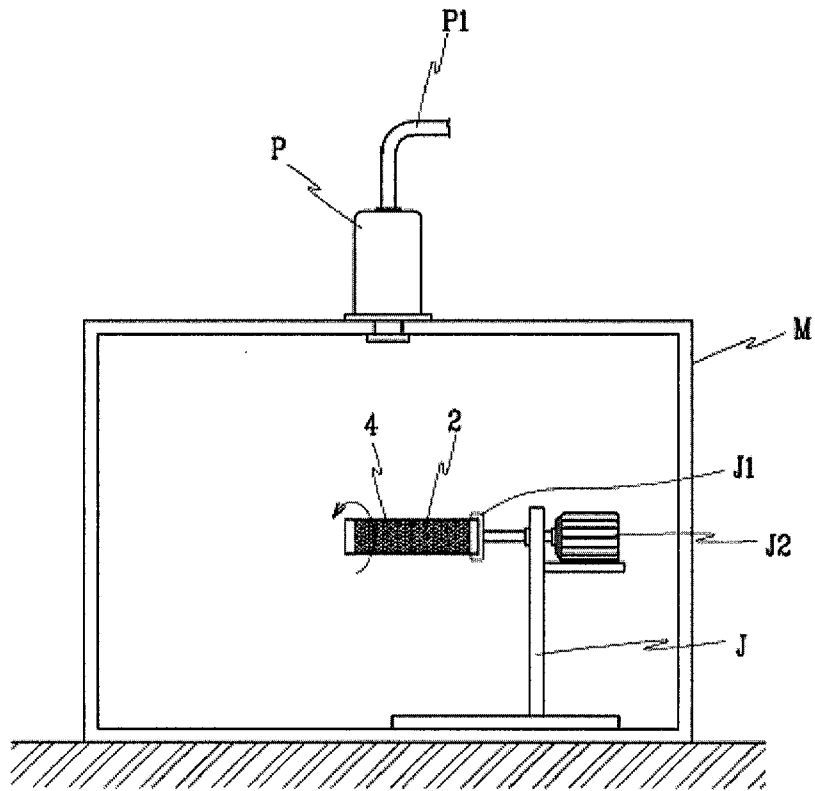
【FIG. 6】



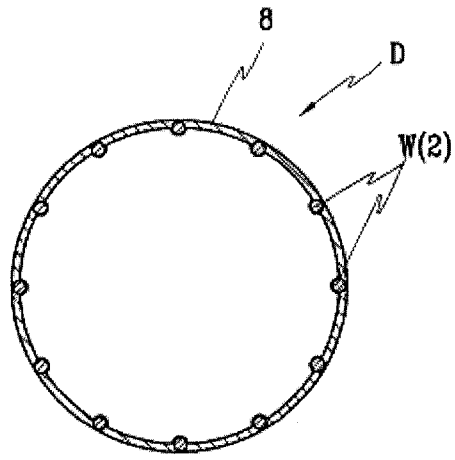
【FIG. 7】



【FIG. 8】



【FIG. 9】



A. CLASSIFICATION OF SUBJECT MATTER*A61F 2/82(2006.01)i*

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 8 A61F 2/82

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

Korean Utility models and applications for Utility Models since 1975

Japanese Utility models and applications for Utility Models since 1975

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

eKIPASS(KIPO internal), DELPHION, "stent, cover, coat*, treat*, film, and similar terms"

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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Y	See figures 1, 2, column 2, lines 21-67, and column 4, lines 1-53.	2, 3, 5
Y	US 6685739 B2 (KRISTIAN DiMATTEO et al.) 03 February 2004 See figures 1-13.	2, 5
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A	US 6800089 B1 (CHICHENG WANG) 05 October 2004 See the whole document.	1-10

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

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Date of the actual completion of the international search

29 OCTOBER 2007 (29.10.2007)

Date of mailing of the international search report

29 OCTOBER 2007 (29.10.2007)

Name and mailing address of the ISA/KR

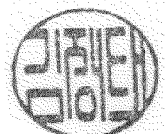
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Telephone No. 82-42-481-8385



INTERNATIONAL SEARCH REPORT

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