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(51) INT CL<sup>7</sup>

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(52) UK CL (Edition V )

**A5R RAR**

(56) Documents Cited

**EP 1159933 A2**      **EP 0405303 A1**  
**WO 2000/038591 A1**      **WO 1990/000498 A1**  
**US 5486191 A**      **US 4596548 A**  
**US 20010007947 A1**  
**WPI ABSTRACT ACC NO 1991-258271 OF**  
**SU001613835 A (ADAMOVSIIJ)**  
**WPI ABSTRACT ACC NO 1986-160610 AND EPODOC**  
**ABSTRACT OF NL008403279 A (PHILIPS)**

(58) Field of Search

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Other: **ONLINE: WPI, EPODOC, JAPIO.**

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(54) Abstract Title

**HELIX SHAPED INSERT FOR FLOW MOIFICATION IN A DUCT OR STENT**

(57) An insert for a duct which is a helical ribbon. The propeller shaped strip may have a flat surface, possess a longitudinally extending fin or rib along one edge or intermediate between the edges or it may have two fins, at least one of which extends along a lengthwise edge. The insert is located in a duct so that its cross section intersects the ducts diameter cross section and may have a pitch in relation to its length such that one end is angularly displaced from the other by one revolution. The insert which may be made of a biodegradable or biocompatible material, may be lodged inside a vein, artery or a graft or in a stent which may be a mesh cylinder. The insert may be used in industrial or engineering pipework. The insert is to cause vortical or helical fluid flow.



FIG.6

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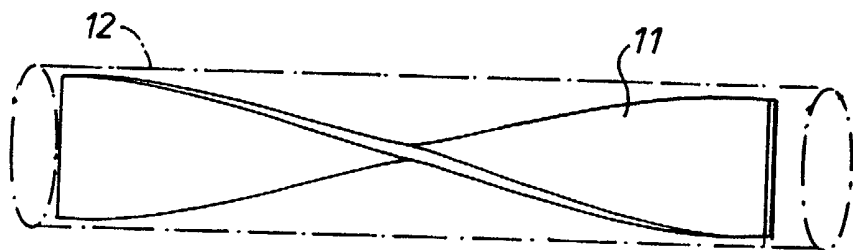


FIG. 1

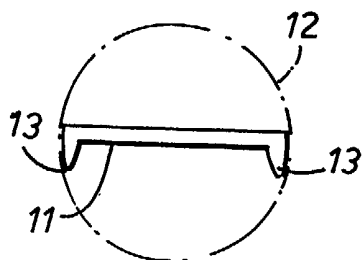


FIG. 2

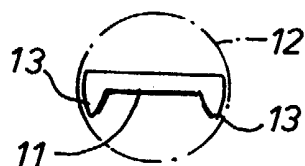


FIG. 3

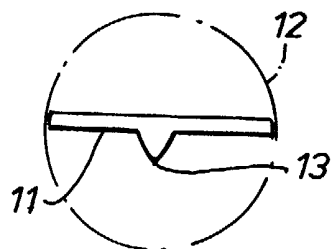


FIG. 4

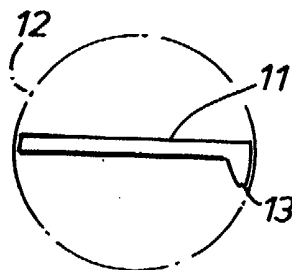


FIG. 5

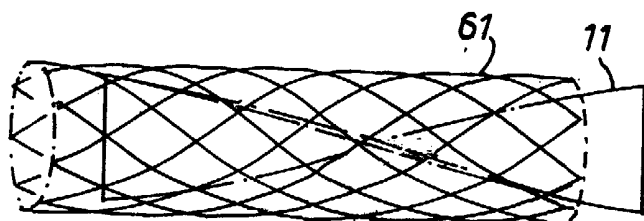


FIG. 6

### Flow Modification

This invention relates to flow modification in ducts, for example flow  
5 modification in blood flow tubing such as veins and arteries of the human or animal body  
for the purpose of effecting helical flow therein.

In WO 00/38591 is disclosed modified blood flow tubing and stents for use  
in blood flow tubing with spiral configurations that induce spiral (or helical) flow in the  
10 tubing. It is evidence that this has a beneficial effect if it is so induced as to eliminate, or  
at least reduce, turbulence and dead flow spots in the tubing where blood solids can settle  
and build up plaque.

Stents are already used to open up and/or maintain open constricted arteries,  
15 and, as disclosed in WO 00/38591, can incorporate helical formations, such as well induce  
the desired spirality of flow.

However, stents are already of some complexity, arising from the need to  
introduce them in compact form for easy passage through the artery to the target site, then  
20 to expand them to open the restriction or to fit a previously opened restriction. Introducing  
a helical flow inducing configuration is an added complication.

The present invention provides a means of effecting spiral flow that does not  
involve complications in stents, and that is simple and straightforward to manufacture and  
25 to implant.

The invention comprises an insert for a duct adapted to effect helical flow in  
the duct comprising a ribbon having a helical formation.

The ribbon may be, in cross-section, flat. However, it may have a lengthwise-extending fin, which may extend along an edge of the ribbon, or may extend, lengthwise, intermediate the edges of the ribbon.

5                   The ribbon may have two fins, at least one extending along an edge.

The ribbon may be so configured in relation to a duct for which it is adapted that its cross-section at any position along the duct is substantially on a diameter of the duct cross-section.

10                   The insert may be adapted to lodge inside a vein or artery of the human or animal body, and may be adapted to lodge inside a stent in a vein or artery of the human or animal body, or a graft therein.

15                   The insert may have a pitch, in relation to its length, such that one end is angularly displaced from the other by substantially one revolution.

20                   The insert, for use in the human or animal body, will comprise a biocompatible material, if it is to be left for any length of time. The insert may also be biodegradable, so that it can serve for a predetermined period of time without needing to be removed.

25                   The invention also comprises an insert as above set forth in combination with a stent. The stent may comprise a cylindrical mesh cage structure.

                    Inserts and combinations thereof with stents, according to the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a view of a first insert in a duct;

Figure 2 is a cross-section of a second insert in a duct;

5 Figure 3 is a cross-section like Figure 2 of a third insert;

Figure 4 is a cross-section like Figure 2 of a fourth insert;

10 Figure 5 is a cross-section like Figure 2 of a fifth insert;

Figure 6 is a view of a stent with an insert.

The drawings illustrate inserts 11 for ducts 12 adapted to effect helical flow in the ducts 12 comprising a ribbon having a helical formation.

15

The insert 11 illustrated in Figure 1 has a flat cross-section (insert).

The insert 11 of Figure 2 has edgewise, lengthwise-extending fins 13, the fins 13 projecting from the same face of the ribbon and being small in cross-section in relation to the width of the ribbon.

20

Figure 3 illustrates an insert 11 which is for a smaller duct than that of Figure 2, while being generally familiar in regard to its cross-sectional appearance.

25 Figure 4 illustrates an insert with a fin 13 extending lengthwise intermediate the edges of the ribbon.

Figure 5 illustrates an insert 11 with just one edgewise fin 13.

Generally speaking, it is preferred that the fins 13 are directed inwardly of the spiral formation of the inserts 11. The fins may serve to assist in effecting spiral flow and/or serve as locators against the inner wall of the artery, stent or graft.

5           As seen from the drawings, the inserts 11 are so configured in relation to ducts 12 for which they are adapted that their cross-sections at any position along them are substantially on a diameter of the duct 12 cross-section.

10           For a human artery, a typical insert may be some 10-60 mm long with a width of 6 mm, thereby adapted to lodge inside an artery or a graft.

15           However, the insert 11 may be adapted to lodge inside a stent 61 which is itself implanted in a vein or artery or graft - see Figure 6. The stent 61 comprises a cylindrical mesh cage.

          In any event, the insert 11 may have a pitch, in relation to its length, such that one end is angularly displaced from the other by substantially one revolution.

20           This is found to impart favourable spiral flow to flow in a vein or artery, eliminating, or at least reducing, turbulence and dead spots with reduction of plaque formation.

25           For inserts intended to remain on more than just a temporary basis, a biocompatible material will be selected, and a smooth structure with rounded ends will be preferred so as not to introduce any turbulence into the flow.

          The use of stents as described is clearly not restricted to blood flow tubing. Other tubing - including external blood flow, eg. dialysis and heart-lung machine tubing,

as well as tubing and pipework in industrial and civil engineering could also benefit from inserts, as described herein, and the invention, whilst it has been specifically described and illustrated with reference to blood flow tubing is to be regarded as of more general application.

## CLAIMS

1. An insert for a duct adapted to effect helical flow in the duct comprising a ribbon having a helical formation. ✓

5

2. An insert according to claim 1, in which the ribbon is, in cross-section, flat. ✓

3. An insert according to claim 1, in which the ribbon has a lengthwise-extending fin. ✓

10

4. An insert according to claim 3, in which the fin extends along an edge of the ribbon. ✓

15

5. An insert according to claim 3 or claim 4, having two fins, of which at least one extends along an edge of the ribbon. ✓

6. An insert according to claim 3, in which the fin extends lengthwise and intermediate the edges of the ribbon. ✓

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7. An insert according to any one of claims 1 to 6, in which the ribbon is so configured in relation to a duct for which it is adapted that its cross-section at any position along it is substantially on a diameter of the duct cross-section. ✓

25

8. An insert according to any one of claims 1 to 7, adapted to lodge inside a vein or artery of the human or animal body, or a graft therein. ✓

9. An insert according to any one of claims 1 to 8, adapted to lodge inside a stent in a vein or artery of the human or animal body, or a graft therein.

10. An insert according to claim 8 or claim 9, having a pitch, in relation to its length, such that one end is angularly displaced from the other by substantially one revolution.

5 11. An insert according to any one of claims 1 to 10, comprising a biocompatible material. ✓

12. An insert according to any one of claims 1 to 11, comprising a biodegradable material. ✓

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13. An insert according to any one of claims 1 to 12, in combination with a stent.

14. A combination according to claim 13, in which the stent comprises a cylindrical mesh cage structure.

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**Application No:** GB 0305703.1  
**Claims searched:** 1-13

**Examiner:** Dr R.A. Lewis  
**Date of search:** 14 May 2003

## Patents Act 1977 : Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	1, 2, 7, 8, 9, 11, 13, 14	WO00/38591 A2	(TAYSIDE UNIVERSITY HOSPITAL NHS TRUST) see page 3, lines 21-24; Page 10, lines 9-18; Figures 6, 7 9.
X	1, 2, 7, 8, 12	WO90/04982 A1	(BIOCONOY) see page 14, lines 24-26; page 17, line 20-page 19, line 3; Figures, and in particular figures 10c and 11e
X	1-5	WPI abstract Acc. No. 1991-258271 of SU1613835 A (ADAMOVSIJ)	see whole document
X	1, 2, 7	EP0405303 A1	(SUMITOMO LIGHT METAL INDUSTRIES LTD) see column 2, l. 39-column 3, l. 34; Figure 1.
E/X	1, 8	EP1159933 A2	(ZULI HOLDINGS) see column 6 line 54-column 7 line 9 and Figure 7.
X	1	WPI abstract Acc. No. 1986-160610 and EPODOC abstract of NL8403279 A (PHILIPS)	
X	1, 3, 6, 7, 8	US5486191 A	(PASRICHA ET AL) see whole document and in particular column 1, line 51-column 2, line 45; Figure 2
X	1, 3, 6, 8,	US4596548	(DEVRIES ET AL) see column 2 line 13-column 3 line 19 and Figure 8.
X	1, 8	US20010007947 A1	(KANESAKA) see whole document and in particular page 1, paragraphs 0010-0012; page 2, paragraphs 0030-0031; Fig 2.

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.



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**Application No:** GB 0305703.1  
**Claims searched:** 1-13

**Examiner:** Dr R.A. Lewis  
**Date of search:** 14 May 2003

**Field of Search:**

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>v</sup>:

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Worldwide search of patent documents classified in the following areas of the IPC<sup>7</sup>:

A61F2/01, A61F2/06, A61F2/04
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The following online and other databases have been used in the preparation of this search report:

PAJ/WPI/EPODOC
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