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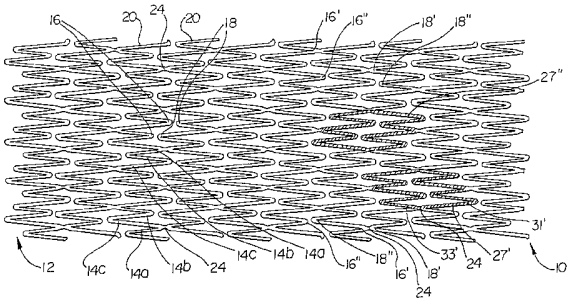
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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) Date of publication of the international search report:
24 June 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: STENT WITH IMPROVED FLEXIBILITY



(57) Abstract: A stent comprises a plurality of connected serpentine circumferential bands (20). Adjacent serpentine circumferential bands are connected via a plurality of longitudinal connectors (24) extending between peaks (16) on one serpentine circumferential band and troughs (18) on the serpentine circumferential band adjacent thereto. The struts (14) of the serpentine bands are arranged such that on expansion of the stent, peaks and troughs which are substantially circumferentially aligned with one another, but not connected with one another, on adjacent serpentine circumferential bands are circumferentially displaced from one another.

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INTERNATIONAL SEARCH REPORT

Inter al Application No
PC1/US 03/29434

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61F2/06

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 A61F

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.
X Y	WO 00/30563 A (SCIMED LIFE SYSTEMS INC) 2 June 2000 (2000-06-02) page 7, line 17 - page 9, line 2 page 11, line 31 - page 13, line 31 figures 2,3,9-11 -----	1-7,11, 13-15 10
Y	WO 02/060344 A (GIRTON TIMOTHY SAMUEL ;SCIMED LIFE SYSTEMS INC (US); DORAN BURNS P) 8 August 2002 (2002-08-08) page 12, line 17 - line 30 figure 15 -----	10

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

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 January 2004	28. 04. 2004

Name and mailing address of the ISA	Authorized officer
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	Skorovs, P

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

ational application No.
PCT/US 03/29434

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-15

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15

A stent comprising: at least two serpentine circumferential bands having alternating peaks and troughs, a plurality of unconnected peak-trough pairs, a plurality of connected peak-trough pairs, the distance along the first serpentine circumferential band between each peak of a connected peak-through pair and an adjacent unconnected peak-through pair differing from the distance along the second serpentine circumferential band between the trough of the connected peak-through pair and an adjacent trough of an unconnected peak-through pair, the adjacent peak substantially opposite the adjacent trough.

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2. claims: 16-24

A stent comprising: a plurality of serpentine circumferential bands having alternating peaks and troughs, the first, second and third serpentine circumferential bands including high peaks and low peaks, the high peaks of the one serpentine circumferential band substantially circumferentially aligned with the low troughs of the next serpentine circumferential band, wherein the first serpentine circumferential band is interlaced with the second serpentine circumferential band and the second serpentine circumferential band is interlaced with the third serpentine circumferential band.

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3. claims: 25-28

A stent comprising: a plurality of connected serpentine circumferential bands comprising a plurality of struts arranged in alternating peaks and troughs, adjacent serpentine circumferential bands connected via plurality of longitudinal connectors extending between peaks on one serpentine circumferential band and troughs on the serpentine circumferential band adjacent thereto, the struts of the serpentine bands arranged such that on expansion of the stent, peaks and troughs which are substantially circumferentially aligned with one another, but not connected with one another, on adjacent serpentine circumferential bands are circumferentially displaced from one another.

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4. claims: 29-32

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A stent comprising: at least one serpentine circumferential band comprising a plurality of struts, the serpentine band having alternating peaks and troughs, the serpentine band including at least three peaks which are circumferentially and longitudinally offset from one another.

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5. claims: 33-34

A stent comprising: at least one serpentine circumferential band comprising a repeat pattern of three ore more struts of different lengths arranged in a pattern of alternating peas and troughs.

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6. claims: 35-37

A stent comprising: at least two serpentine bands having alternating peaks and troughs, the first serpentine band including connected peaks and unconnected peaks, the second serpentine band including connected troughs and unconnected troughs, the peaks of the first serpentine band being substantially longitudinally aligned with the throughs of the second serpentine band when the stent is in an unexpanded state, the connected peaks connected to the connected troughs with connectors which are substantially circumferentially aligned with one another, wherein the unconnected peaks of each band become circumferentially displaced from the unconnected troughs of an adjacent band, and the unconnected troughs of each band become circumferentially displaced from the unconnected peaks of an adjacent band.

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7. claims: 38-42

A stent comprising: at least two serpentine bands having alternating peaks and troughs, the first serpentine band including connected peaks and unconnected peaks, the second serpentine band including connected troughs and unconnected troughs, the first and second serpantine bands having an identical number of peaks,the peaks of the first serpentine band being substantially longitudinally aligned with the throughs of the second serpentine band when the stent is in an unexpanded state, wherein the unconnected peaks of each band become circumferentially displaced from the unconnected troughs of an adjacent band, and the unconnected troughs of each band become circumferentially displaced from the unconnected peaks of an adjacent band.

INTERNATIONAL SEARCH REPORT

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0030563 A	02-06-2000	CA 2316286 A1	02-06-2000
		EP 1049421 A1	08-11-2000
		JP 2002530146 T	17-09-2002
		WO 0030563 A1	02-06-2000
		US 2002007212 A1	17-01-2002
		US 2002055770 A1	09-05-2002
WO 02060344 A	08-08-2002	CA 2397373 A1	08-08-2002
		EP 1318765 A2	18-06-2003
		WO 02060344 A2	08-08-2002
		US 2002116049 A1	22-08-2002
		US 2002095208 A1	18-07-2002
		US 2002055770 A1	09-05-2002