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(54) Title: CATHETER WITH HELICAL DRIVE SHAFT AND METHODS OF MANUFACTURE

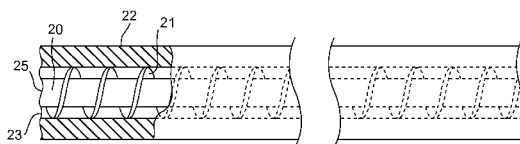


Fig. 2

(57) Abstract: Drive shafts (20) having helical blades (21) and methods of making are disclosed. In one method a helical auger blade is formed by twisting or sculpting a heated polymer tube which has been placed over a cylindrical drive shaft. In another method a drive shaft is placed within a helical winding and heat is applied to melt polymer which has been coated over one or both of the drive shaft and helical winding.



**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/US2012/053181

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. B29C53/14 A61B17/3207  
ADD.

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)  
B29C A61B

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 practicable, 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.
A	US 2008/004646 A1 (TO JOHN [US] ET AL) 3 January 2008 (2008-01-03) paragraphs [0069], [0070] figure 5A -----	1-5
A	US 4 886 490 A (SHIBER SAMUEL [US]) 12 December 1989 (1989-12-12) column 3, line 33 - line 36 column 5, line 32 - line 35 -----	1
A	GB 2 016 354 A (PRACY H R) 26 September 1979 (1979-09-26) abstract; figures 2,3 -----	1
A	US 2008/065124 A1 (OLSON WILLIAM J [US]) 13 March 2008 (2008-03-13) paragraphs [0041], [0070], [0071] figures 4A,4B -----	1

Further documents are listed in the continuation of Box C.

See patent family 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 application or patent 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

16 November 2012

Date of mailing of the international search report

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2012/053181

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 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 fees, this Authority did not invite payment of additional fees.
  
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.:

1-5

### Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- 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: 1-5

Method for making a helical drive shaft including a step of twisting a polymer tube

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2. claims: 6-12

Method of making a helical drive shaft using one or more heated tools

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3. claims: 13-26

Method of making a helical drive shaft including a step of coating with a polymer

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/053181

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2008004646 A1	03-01-2008	US 2008004646 A1 US 2011301626 A1	03-01-2008 08-12-2011
US 4886490 A	12-12-1989	NONE	
GB 2016354 A	26-09-1979	NONE	
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