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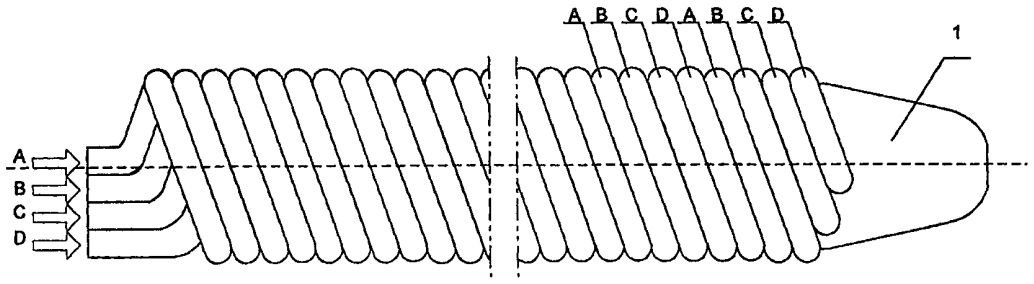
(54) Title: CATHETER



(57) Abstract

Catheter, which according to the invention comprises a flexible double walled tube made of elastic material. The space, enclosed between the two walls is divided in chambers, which are consecutively connected along the length of the catheter. The chambers are connected in separate groups, and the number of the groups is four. Each of the groups is connected to a system, which supplies them with fluid. The fluid is able to move freely between the consecutive chambers, belonging to each of the chamber groups. Each of the chamber groups could be performed in form of a spiral. In the walls of at least two of the chamber groups (for example second and fourth), fibers of non elastic material could be placed, with their axis perpendicular to the chambers' cross sections. The chambers from groups two and four are performed with smaller radial and bigger axial dimensions than the chambers from groups one and three. As a working fluid, a biologically compatible liquid could be used.

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C A T H E T E R

BACKGROUND OF THE INVENTION

Field of the Invention

This invention concerns a catheter and finds application for medical manipulations.

State of art

A catheter is known, which comprises a double wall tube, made of elastic material [1]. The main disadvantages of this catheter are, that it is getting in contact with the surrounding tissues, thus causing non controlled force impact on and friction with the tissue's surfaces, which may injure them. Another disadvantage of this catheter is, that the manipulations with it are performed manually, due to which the human factor acquires primary significance.

SUMMARY OF THE INVENTION

The nature of the invention concerns a catheter, which according to the invention comprises a flexible double walled tube made of elastic material. The space, enclosed between the two walls is divided on cambers, which are consecutively connected along the length of the catheter. The chambers are connected in separate groups, and the number of the groups is four. Each of the groups is filled with fluid and connected to a hydraulic or pneumatic feeding system in a way, that the fluid is able to move freely between the consecutive chambers, belonging to each of the chamber groups. Each of the chamber groups could be performed in form of a spiral. In the walls of at least two of the chamber groups (for example second and fourth), fibers of non elastic material could be placed, with their axis perpendicular to the chambers' cross sections. The chambers from groups two and four are performed with smaller radial and bigger

axial dimensions then the chambers from groups one and tree. As an working fluid, a biologically compatible liquid could be used.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows the general view of the catheter, when using four groups of chambers.

Fig. 2 shows the arrangement of chambers, when using four groups of chambers.

Fig. 3 shows the sequence of action of the chambers, when using four groups of chambers.

Fig. 4 shows the shape of the catheter's distal end.

Fig. 5 shows the reinforcement of the chambers with longitudinal fibers.

TECHNICAL CHARACTER OF THE INVENTION

The exemplary performance of the catheter is as follows. Each of the groups of chambers A, B, C and D is maid of tube of elastic material in a form of spiral. The spiral A is connected mechanically (for example glued) to the spirals B and D in such a way, that along the whole length of the catheter, chamber B is after camber A, and chamber D is before chamber A. The spiral B is connected mechanically (for example glued) to the spiral C in such a way, that along the whole length of the catheter, chamber C is after camber B. The spiral C is connected mechanically (for example glued) to the spiral D in such a way, that along the whole length of the catheter, chamber D is after camber C. The front ends of the spiral tubes enter the catheter's distant end 1 trough the wholes 2, placed on the external wall 3 of the catheter's distant end, in such a way, that are placed in side the room between the external wall 3 and internal wall 4 of the catheter's distant end, and are pressed between the external wall 3 and internal wall 4. The proximal ends of the spiral tubes A, B, C and D are connected to a

pneumatic or hydraulic system. The chambers B and D are performed with smaller radial and with bigger axial dimensions then chambers A and C. The fibers of non elastic material 5 are placed inside the walls of chambers B and D, and are oriented perpendicularly to the chambers' cross sections. In the front end of the catheter's distal end a hole 6 is made.

The performance of the catheter is as follows. When pressure is applied to chamber A, the elastic tube is expanded and gets in contact with the surrounding tissues, so that its position is fixed. When fluid is supplied to chamber B, it expands and shifts chambers C and D. After performance of the shifting, the pressure in chamber C is increased, which expands, gets in contact with the surrounding tissues and is fixed. When the pressure in chambers A and B is reduced, the catheter remains fixed by chamber C. When pressure is applied to chamber D, it expends and shifts forward chambers A and B. When pressure is applied to chamber A, it is fixed to a new position relatively to the surrounding tissues. The fibers from non elastic material, placed in the walls of chambers B and D, assure predominantly axial deformation of these chambers. The direction of movement of the catheter is controlled by the sequence of supplying of fluid to the chambers. For penetrating the human body, the following sequence is performed (fig. 3): A-A&B-A&B&C-C-C&D-C&D&A. For removing the catheter from the human body, the following sequence is performed (fig. 3): C-C&B-C&B&A-A-A&D-A&D&C. In this manner the catheter moves in the selected direction by discrete steps and without any friction.

This invention could be applied for medical manipulations, connected with human body penetration.

References

1. US patent № 5,366,472 "Dilatation balloon within an elastic sleeve"
2. US patent № 5,199,427 "Multi-layered transtracheal catheter"
3. US patent № 5,045,071 "Double wall catheter with internal printing and embedded marker"
4. US patent № 5,218,957 "Multi-layered transtracheal catheter"
5. US patent № 5,169,378 "Intra-ventricular expansible assist pump"

Patent Claims

1. Catheter comprising a double wall tube, made of elastic material, residing in the double wall divided in consecutively connected chambers A, B, C and D, which are repeated along the length of the catheter, so that all of chambers A are connected consecutively to each other, all of chambers B are connected consecutively to each other, all of chambers C are connected consecutively to each other and all of chambers D are connected consecutively to each other, and each of the groups of chambers is connected to a system, which feeds them with a fluid.

2. Catheter, according to claim 1 residing in chambers A, B, C and D, performed if a form of spiral.

3. Catheter, according to claim 1 and 2, residing in the walls of at least two of the chambers (for example B and D) containing fibers of non elastic material, which longitudinal axes are oriented perpendicularly to the chambers' cross sections.

4. Catheter, according to claim 1, and 2, residing in chambers B and D, performed with smaller radial and bigger axial dimensions then chambers A and C.

5. Catheter, according to claim 1, residing in biologically compatible liquid used as working fluid.

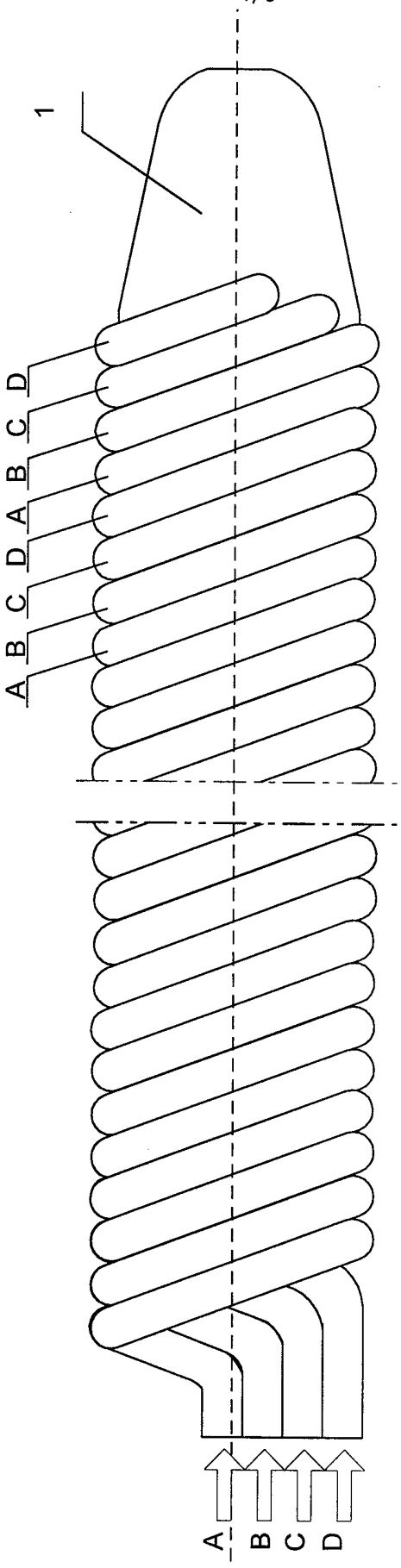

Fig.1.

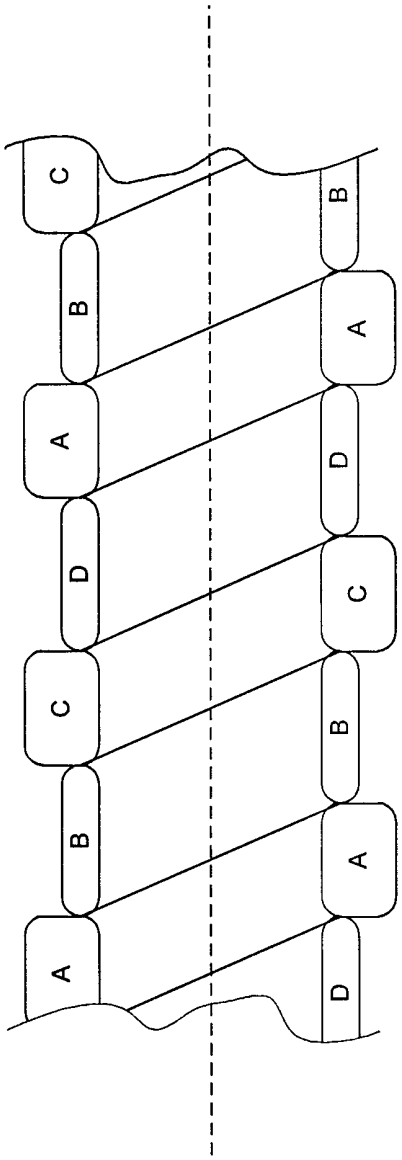

Fig. 2

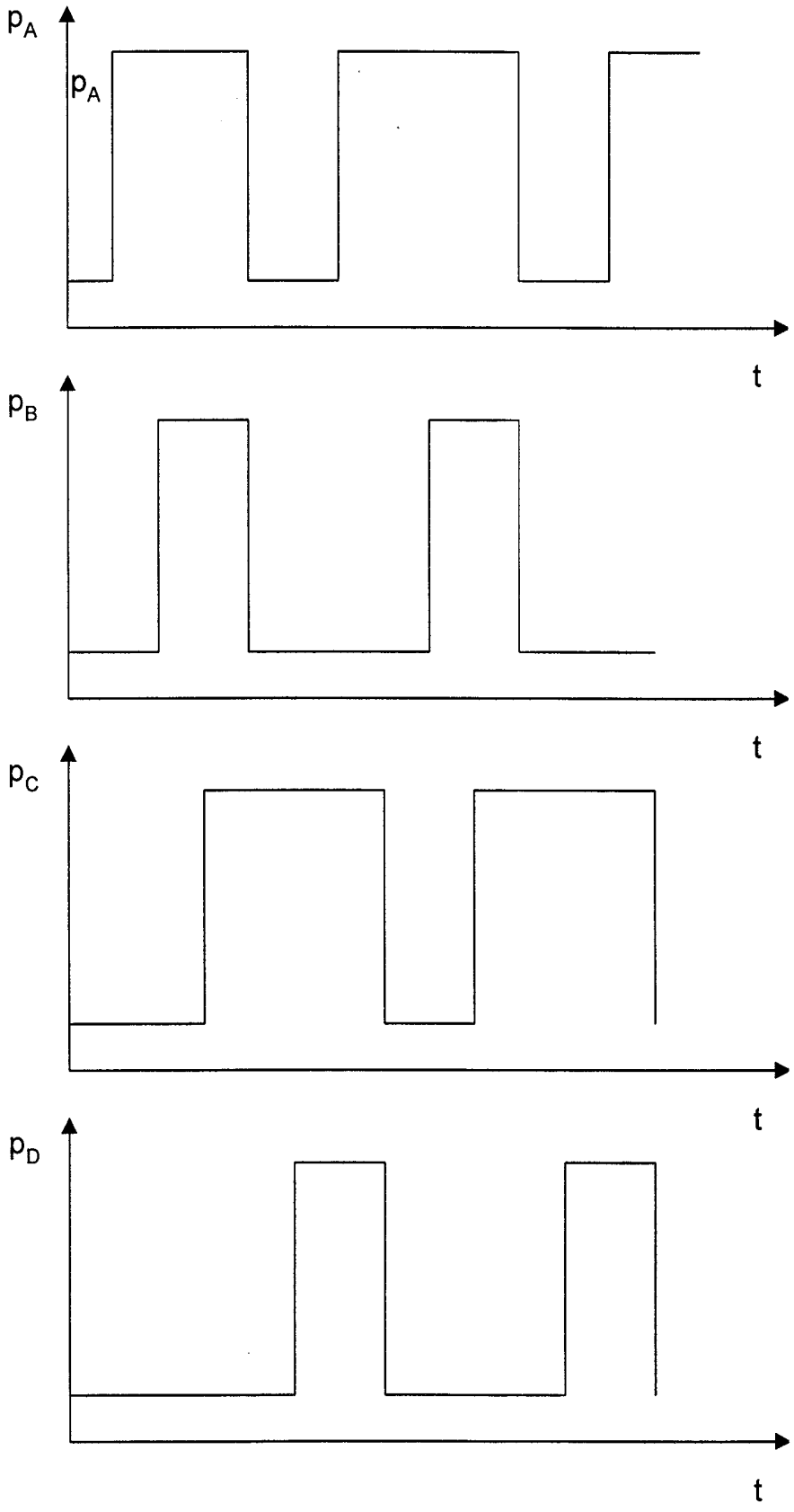

Fig.3

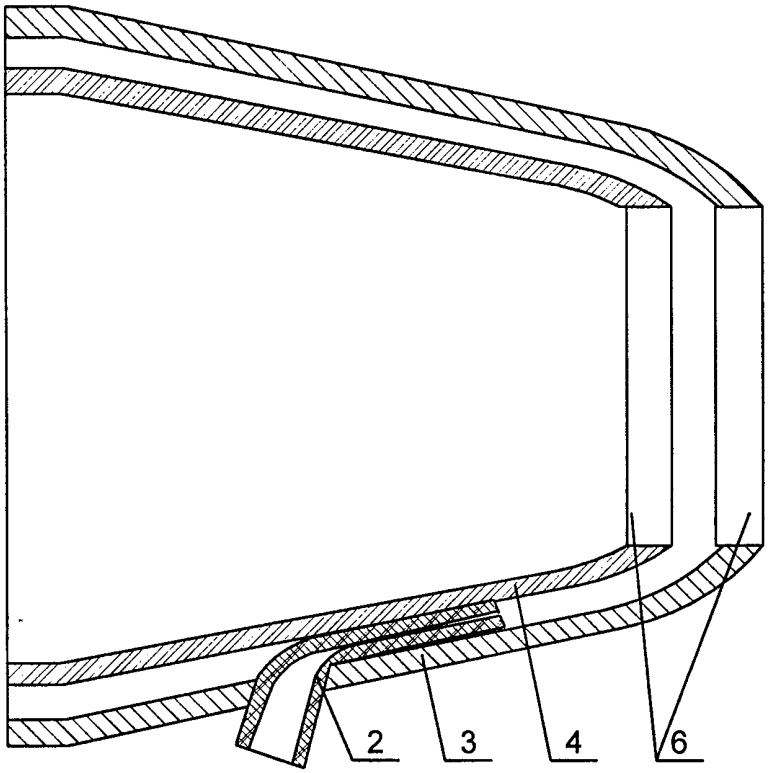

Fig.4

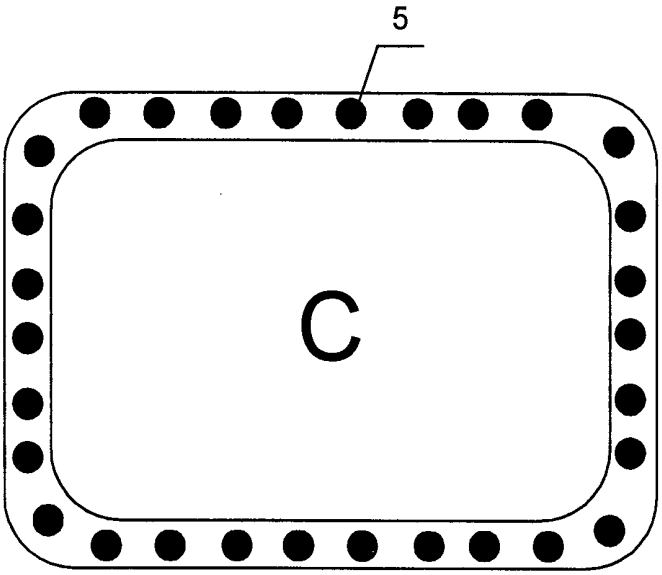

Fig.5

INTERNATIONAL SEARCH REPORT

International Application No
PCT/BG 99/00026

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61M25/01 A61M25/00

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 A61M

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

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 485 237 A (REDFORD) 23 December 1969 (1969-12-23) column 2, line 35 -column 4, line 31 column 4, line 71 -column 5, line 18 figures 1-4	1-5
X	DE 296 21 354 U (LAMADÉ) 9 April 1998 (1998-04-09) the whole document	1
X	DE 26 59 238 A (OLYMPUS OPTICAL CO, LTD) 1 September 1977 (1977-09-01) page 12, line 19 -page 14, line 19 figures 5-8	1

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

☒ Patent family members are listed in annex.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3485237 A	23-12-1969	NONE	
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