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(54) **CATHETER NAVIGATION SYSTEM**

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(57) **ABSTRACT**

A catheter navigation system includes a handle (**100**) which is operated by a user; a tube (**200**) which is configured to be connected to the handle (**100**) and is inserted into a human body; a tube navigation unit (**300**) which pushes one side of the tube (**200**) while pulling the other side so as to bend the tube (**200**) and thus navigate a direction of the tube; a plastic optical fiber (**400**) which is built in the tube (**200**) to transmit a light, with one end of the plastic optical fiber being exposed from a distal end of the tube (**200**); and a cap (**500**) which is connected to the distal end of the tube (**200**) to close the distal end of the tube (**200**).

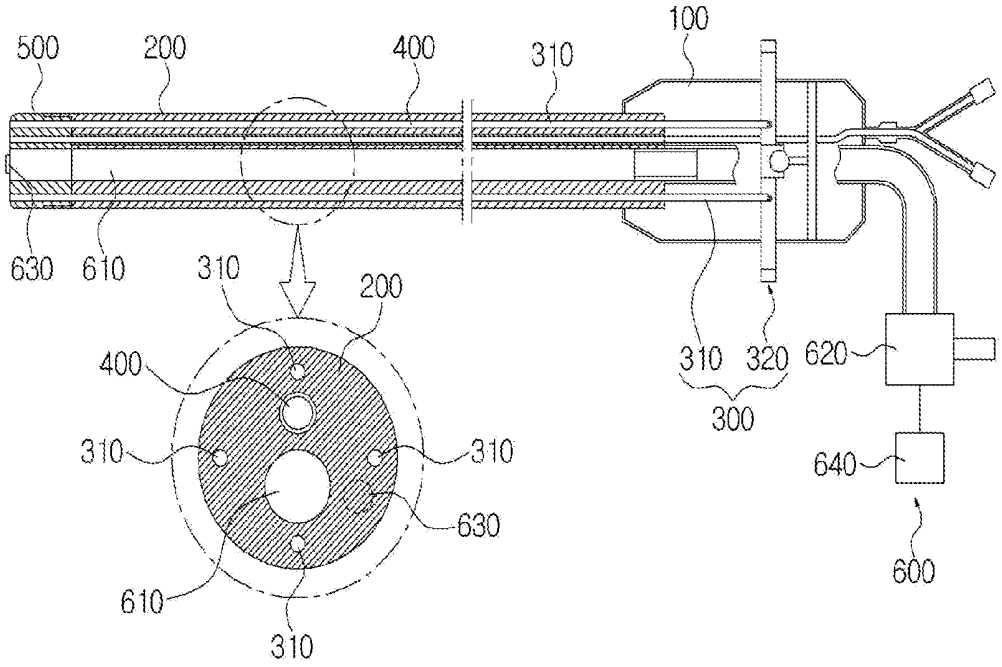


FIG. 1

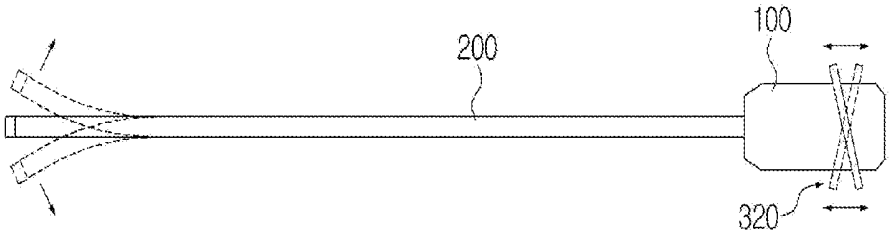

100
200
320

FIG. 2

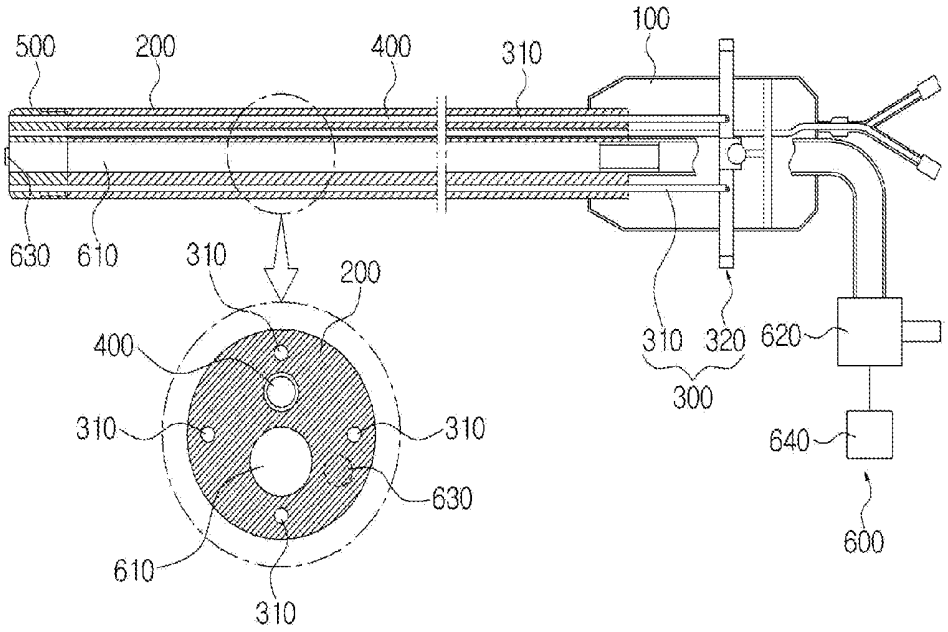

500
200
400
310
100
630
610
310
200
400
310
310
630
610
310
310
320
300
620
640
600

FIG. 3

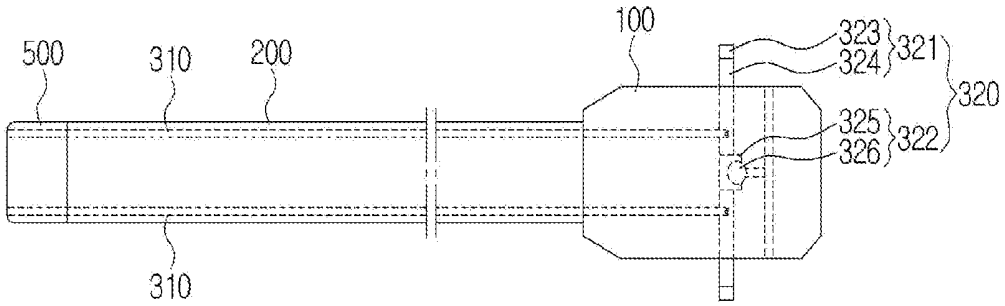
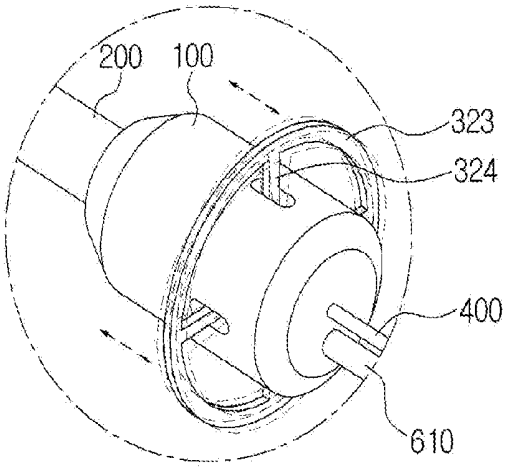

500
310
200
100
323
324
321
320
325
326
322
310

FIG. 4


200
100
323
324
400
610

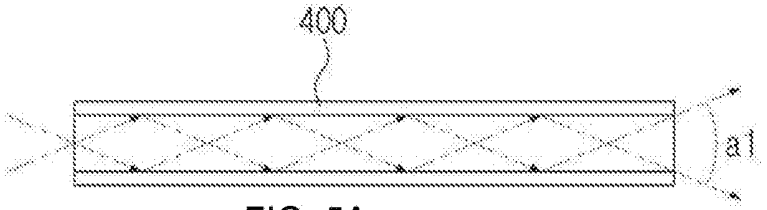


FIG. 5A

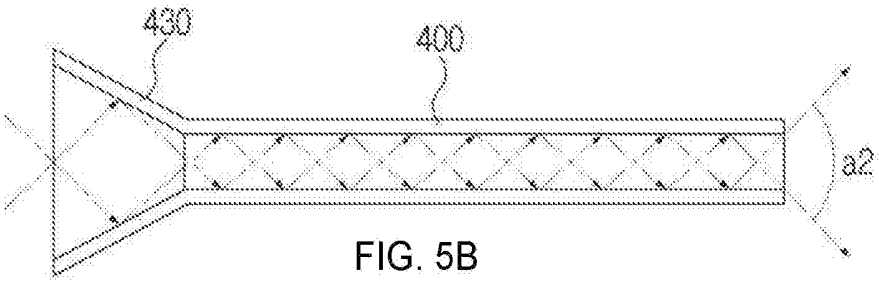


FIG. 5B

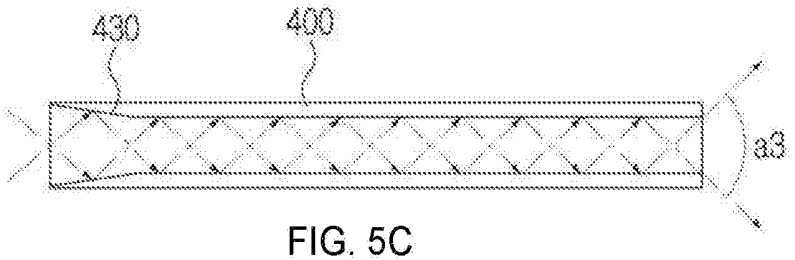


FIG. 5C

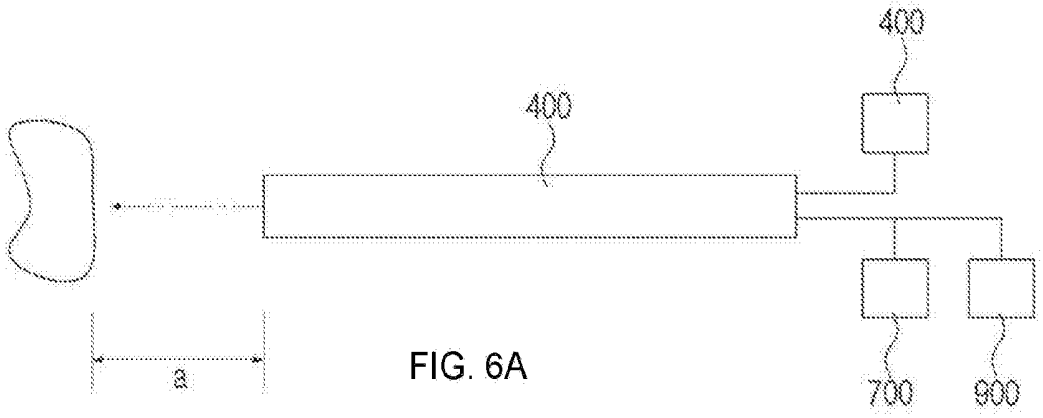


FIG. 6A

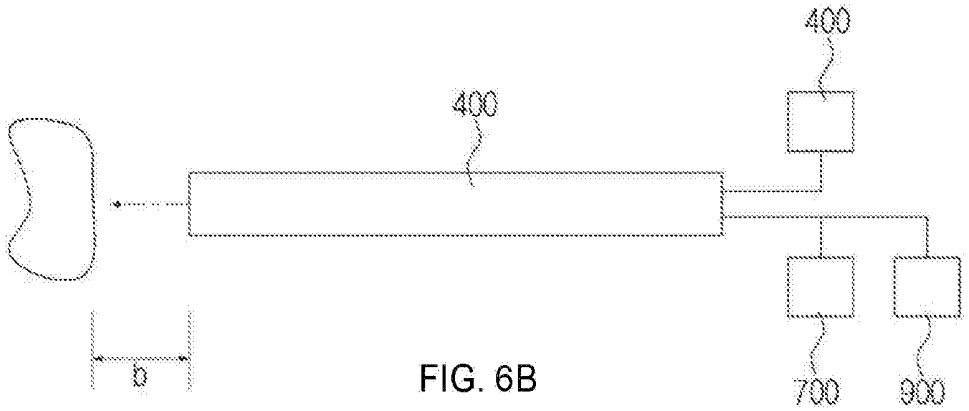


FIG. 6B

FIG. 7A

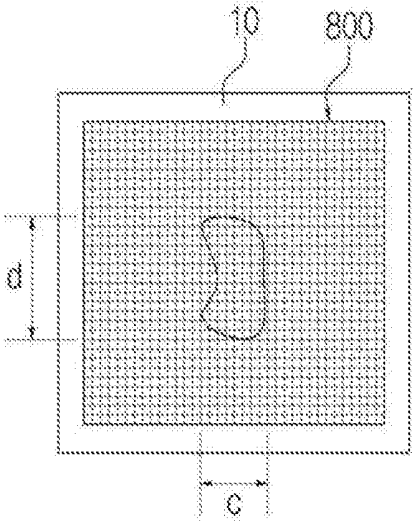


FIG. 7B

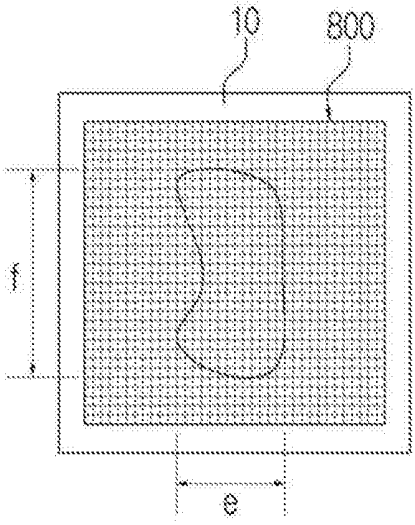
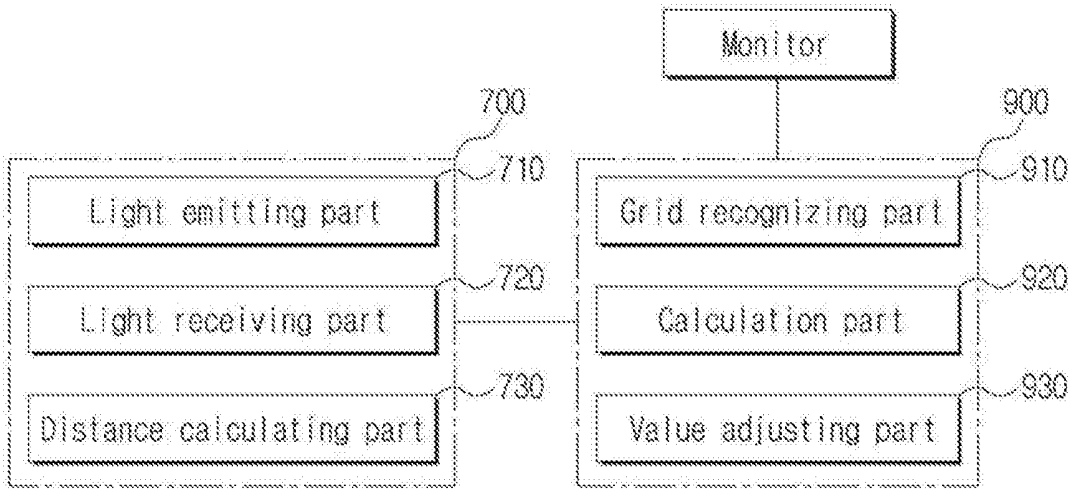


FIG. 8



CATHETER NAVIGATION SYSTEM

CROSS REFERENCE

[0001] This application claims foreign priority under Paris Convention to Korean Patent Application No. 10-2015-0153084, filed 2 Nov. 2015, with the Korean Intellectual Property Office.

BACKGROUND

[0002] The present invention relates to a catheter navigation system capable of more accurately navigating and positioning a tube to be inserted through a patient's body to a surgery site or a region of interest.

[0003] In general, a catheter is a medical appliance of a tube type which is configured to be inserted into a body cavity or an organ of a patient at a surgical operation, and is referred to as a probe. The catheter can be made of various materials, sizes, and shapes, depending upon its application. The catheter is made of rubber, plastic or metal. The catheter is widely used to excrete contents from various body organs, such as a body cavity or an organ, introduce drugs or cleaning solutions into the body organs, and/or inspect the inside of the body organs.

[0004] The conventional catheter is largely divided into two catheters, that is, a drug introducing catheter, of which a drug is able to introduce into a tube, and an inspection catheter, of which a plastic optical fiber is provided in the tube to take a picture of the inside of the body organ. The conventional catheter has a problem in that since the tube is very thin and long, drug introduction and inspection cannot be simultaneously carried out through one tube. Therefore, a drug introducing catheter and an inspection catheter should be separately provided, and two catheters should be alternatively used in order, which gives inconvenience to a surgeon and delays the operation time. Meanwhile, there is another problem in that if the drug introduction and the inspection can be carried out through one tube, the size of the tube is increased to magnify the surgery site, and manipulability of the catheter is decreased to lower the accuracy of the operation.

[0005] The background related to the present invention is disclosed by Korean Patent No. 10-1219710, entitled "probe and device for detecting abnormality of intervertebral disc."

SUMMARY OF THE INVENTION

[0006] Therefore, the present invention has been made in view of the above problems, and an object of the present invention is to provide a catheter navigation system capable of more accurately navigating and positioning a tube to be inserted through a patient's body to a surgery site or a region of interest.

[0007] According to one aspect of the present invention, there is provided a catheter navigation system including: a handle which is operated by a user; a tube which is configured to be connected to the handle and is inserted into a human body; a tube navigation unit which pushes one side of the tube while pulling the other side so as to bend the tube and thus navigate a direction of the tube; a plastic optical fiber which is built in the tube to transmit a light, with one end of the plastic optical fiber being exposed from a distal end of the tube; and a cap which is connected to the distal end of the tube to close the distal end of the tube.

[0008] Preferably, the tube navigation unit includes wires which are housed parallel to each other in the tube, with one ends of the wires being fixed to the distal end of the tube, and the other ends being respectively positioned in the handle, and a wire operating unit which is connected to the other ends of the wires so as to pull one wire and push the other wire.

[0009] Preferably, the wire operating unit includes an operation handle which is connected to the other ends of the wires so as to pull or push one wire and push or pull the opposite wire, and a rotation support member which is provided to the handle so as to support swing movement of the operation handle.

[0010] Preferably, the wires are distributed and built in the tube in four directions, in which the end of the respective wires is fixed to the distal end of the tube, while the other end is connected to the operation handle in four directions, and the operation handle has a ring-shaped body which is operated by the user, and protrusions which protrude inwardly from the body in four directions to fix the other ends of the wires, respectively.

[0011] Preferably, the rotation support member has a female-type rotation support portion for fixing the protrusions, and a male-type rotation portion to which the female-type support portion is connected to be able to rotate in four directions.

[0012] Preferably, the plastic optical fiber includes an optic angle enlarging portion for condensing an incident light so as to enlarge an angle of the light to be emitted, and the optic angle enlarging portion is connected to an inlet side of the plastic optical fiber, and is formed in a funnel shape, of which an inlet for receiving a light illuminated from a light source is formed to be wider than an outlet for emitting the light.

[0013] Preferably, the catheter navigation system further includes a drug supply unit which is built in the tube to supply a drug into an inside of a human body. The drug supply unit includes a drug feed tube which is built in the tube to discharge the drug to be fed from the exterior through a distal end thereof, a drug pump for pumping and feeding the drug to the drug feed tube, a body status measuring member for measuring a status of the human body, and a pump operating member which compares the status of the human body measured by the body status measuring member and a preset reference value, and controls operating speed of the drum pump to adjust a supply amount of the drug according to the compared result.

[0014] Preferably, the body status measuring member has a blood pressure sensor which is provided to the distal end of the tube to be close to the drug feed tube, so as to measure blood pressure of blood flowing in front of the distal end of the tube inserted into the human body.

[0015] Preferably, the catheter navigation system further includes a distance measuring member for measuring a distance of a subject through the plastic optical fiber; a grid frame having a plurality of horizontal lines and a plurality of vertical lines which are spaced at regular intervals, and are displayed on a screen of a monitor; and a dimension calculating member for measuring a dimension of the subject by use of the distance measured by the distance measuring member and the grid frame. The dimension calculating member has a grid recognizing part for recognizing the horizontal lines and the vertical lines which are close to an outside of the subject enclosed by the grid frame, a calcu-

lation part for calculating an interval of the horizontal lines recognized by the grid recognizing part as a horizontal value, and calculating an interval of the vertical lines as a vertical value, and a value adjusting part for decreasing the horizontal value and the vertical value which are calculated by the calculation part as much as the increased distance value measured by the distance measuring member, or increasing the horizontal value and the vertical value which are calculated by the calculation part as much as the decreased distance value measured by the distance measuring member.

[0016] With the above configuration of the catheter navigation system of the present invention, the tube to be inserted into the human body can be accurately navigated and positioned at a surgery site or an inspection position, thereby accurately carrying out the operation or the inspection

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. **1** is a view schematically illustrating a catheter navigation system according to one embodiment of the present invention.

[0018] FIG. **2** is a cross-sectional view illustrating the inside of the catheter navigation system according to the embodiment of the present invention.

[0019] FIG. **3** is a view illustrating a tube navigation unit for manipulating a direction of a tube according to the embodiment of the present invention.

[0020] FIG. **4** is a partially perspective view of major parts of the catheter navigation system according to one embodiment of the present invention.

[0021] FIGS. **5**A to **5**C are view illustrating samples of an optic angle enlarging portion applied to a plastic optical fiber according to the embodiment of the present invention.

[0022] FIGS. **6**A and **6**B are views illustrating a process of measuring the size of a tissue according to the present invention.

[0023] FIGS. **7**A and **7**B are views the state of the tissue displayed on a monitor according to the present invention.

[0024] FIG. **8** is a block diagram schematically illustrating major parts of the catheter navigation system according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0025] Hereinafter, a catheter navigation system according to one embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0026] As illustrated in FIGS. **1** to **5**, the catheter navigation system of the present invention includes a handle **100**, a tube **200**, a tube navigation unit **300**, a plastic optical fiber **400**, and a cap **500**.

[0027] The handle **100** is held by a user, and is formed in a case shape to form a space therein, in which components are installed.

[0028] The tube **200** is configured to be connected to the handle **100** and inserted into a human body. The tube **200** is connected to the handle **100** at one end thereof in a communication manner, and has a plurality of channels with both ends being opened, through which wires **310** of the tube navigation unit **300**, the plastic optical fiber **500**, and drugs and inspection appliances pass. The tube **200** is formed in an elongated shape so as to be easily inserted into the body cavity. Preferably, the tube has a diameter of about 2.5 mm. The channels are passages formed in a longitudinal direction of the tube **200**.

[0029] The tube navigation unit **300** includes the wires which are housed parallel to each other in the tube, the wires pushing one side of the tube **200** while pulling the other side of the tube so as to navigate and position the tube **200** by bending an end of the tube **200**, with one ends of the wires being fixed to the distal end of the tube **200**, and the other ends being respectively positioned in the handle **100**, and a wire operating unit **320** which is connected to the other ends of the wires **310** so as to pull one wire **310** and push the other wire **310**.

[0030] The wires **310** are built in the channels of the tube **200**, and push the end of the tube if the wire is pushed by an external force, or pull the end of the tube if the wire is pulled by the external force. The wires **310** may be made of a soft cord which is flexible by the external force, like a synthetic resin. Accordingly, if the wire **310** positioned at an upper portion of the tube **200** is pulled, the wire **310** positioned at a lower portion of the tube **200** is pushed, such that the distal end of the tube **200** is bent in an upward direction.

[0031] The wire operating unit **320** includes an operation handle **321** which is connected to the other ends of the wires **310** so as to pull or push one wire **310** and push or pull the opposite wire **310**, and a rotation support member **322** which is provided to the handle **100** so as to support swing movement of the operation handle **321**.

[0032] The wires **310** are distributed and built in the tube **200** in four directions, in which the end of the respective wires **310** is fixed to the distal end of the tube **200**, while the other end is connected to the operation handle **321** in four directions.

[0033] The operation handle **321** has a ring-shaped body **323** which is operated by the user, and protrusions **324** protruding inwardly from the body **323** in four directions to fix the other ends of the wires **310**.

[0034] The rotation support member **322** has a female-type rotation support portion **325** for fixing the protrusions **324**, and a male-type rotation portion **326** to which the female-type support portion **325** is connected to be able to rotate in four directions.

[0035] The body **323** is formed in a ring shape, and is positioned on the outside of the handle **10**.

[0036] The protrusions **324** protrude inwardly from the body **323** in a substantially cross shape, and are fixed to the female-type rotation support portion **325** of the rotation support member **322** while penetrating the inside of handle **10**.

[0037] The female-type support portion **325** is formed with a substantially dome-shaped groove on an inner portion thereof, and the male-type rotation support portion **326** is formed with a spherical boss on a distal end thereof. Thus, the female support portion **325** can be rotated around the male-type rotation support portion **326** in the four directions. The rotation support member **322** may be formed of a ball joint.

[0038] If the one side of the operation handle **321** is pulled rearward by the user, the opposite side of the operation handle **321** which can swing on the rotation support member **322** is moved forward. That is, the operation handle **321** swings around the rotation support member **322** as an axis. In this instance, the wire **310** connected to the operation

handle **321** moving rearward is also pulled to the rearward. On the contrary, the wire **310** connected to the operation handle **321** moving forward is also pushed to the forward. Thus, the distal end of the tube **200** is bent toward the pulling direction of the wire **310**.

[0039] With the above configuration, the wires **310** can be moved in opposite directions by use of one operation handle **321**, thereby quickly bending the tube **200**.

[0040] If the wires **310** made of two, four, eight, or 16 cords are disposed in the tube **200** at regular intervals and are connected to the operation handle **321**, the tube **200** can be precisely bent in two, four, eight or 16 directions.

[0041] The plastic optical fiber (POF) **400** is to transmit the light in a state in which the plastic optical fiber is built in the tube **200**, with one end being exposed from the distal end of the tube **200**. Illumination light can be transmitted through the plastic optical fiber, and a camera can be connected to the plastic optical fiber to take a picture. The plastic optical fiber **400** may be built in other channel of the tube **200**, and the end of the plastic optical fiber may be exposed outwardly from the distal end of the tube **200**, so that the inside of the human body can be taken by the camera connected to the plastic optical fiber **400**, and the illumination light can be provided onto the human body which is taken by the camera, by illumination connected to the plastic optical fiber **400**.

[0042] Also, the plastic optical fiber **400** has an optic angle enlarging portion **430** for condensing the incident light so as to enlarge an angle of the light emitted.

[0043] The optic angle enlarging portion **430** is connected to an inlet side of the plastic optical fiber **400**, and is formed in a coupler of a funnel shape, of which an inlet for receiving the light is formed to be wider than an outlet for emitting the light, as illustrated in FIG. **5**B. Also, the optic angle enlarging portion **430** may be formed in such a way that an inner peripheral surface of the inlet side of the plastic optical fiber **400** is enlarged than an inner peripheral surface of the outlet side, as illustrated in FIG. **5**C.

[0044] As illustrated in FIG. **5**A, a light of a substantially straight shape having a narrow incident angle is input into an inlet side of a plastic optical fiber **420** for illumination, and then a light of a straight shape can be outputted from the outlet side as much as the incident light. That is, the light can be outputted to have a narrow optic angle a**1**.

[0045] As illustrated in FIG. **5**B, however, if the light is condensed by the coupler, that is, the optic angle enlarging portion **430**, and then is inputted into the inlet side of the plastic optic fiber **400**, the light can be outputted at an enlarged optic angle from the output side as much as the condensed light. For example, if the light is incident and condensed at an angle of about 120 degrees by a slope surface formed on the inner portion of the coupler, that is, the optic angle enlarging portion **430**, and then is inputted into the inlet side of the plastic optical fiber **400**, the light having an optic angle a**2** which corresponds to about 120 degrees can be outputted from the outlet side of the plastic optical fiber **400**.

[0046] As illustrated in FIG. **5**C, in the case where the optic angle enlarging portion **430** has the slope surface which is formed on the inner peripheral surface of the inlet side of the plastic optical fiber **400** to have an increased angle, the light having the increased optic angle a**3** can be outputted.

[0047] As described above, if the plastic optical fiber **400** has the plastic optical fiber **420** for illumination, and the optic angle enlarging portion **430**, the illumination of the enlarged angle can be applied to the bodily tissue of a wider range. If the plastic optical fiber **400** has the optic angle enlarging portion **430**, the angle of view is increased, thereby providing the illumination in the wider range, as well as taking a picture of the wider bodily tissue.

[0048] The cap **500** is engaged to the distal end of the tube **200**, and is formed with mounting holes corresponding to the channels of the tube **200** to receive the wires **310** and the plastic optical fiber **400** therein.

[0049] The plastic optical fiber **400** is provided to be exposed from the front surface of the cap **500**, and the front surface of the cap **500** and the front surface of the plastic optical fiber **400** may be polished to have a curved surface having a desired curvature which protrudes forward.

[0050] Since the cap **500** is mounted to the distal end of the tube **200**, and the wire **310** is fixed to the cap **500**, the wires can be firmly fixed, thereby preventing the ends of the wires **310** from being separated or broken due to repeated use and thus improving its durability.

[0051] In addition, the wires **310** and the plastic optical fiber **400** are not directly coupled to the tube **200**, but are fixed to the cap **500** at the distal end of the tube **200**, thereby firmly maintaining the fixed state.

[0052] The operation of the catheter navigation system according to the present invention will now be described.

[0053] First, after the tube **200** is inserted into the human body, the user operates the wire operating unit **320** to navigate the distal end of the tube **200** in a desired direction.

[0054] The user swings the operation handle **321** of the wire operating unit **320** to allow the tube **200** to face in any one direction. Specifically, the distal end of the tube **200** can be accurately navigated and positioned at a desired position by the simple operation of the user, thereby improving the accuracy of the operation or inspection.

[0055] Therefore, the user can take a picture of the inside of the human body by the plastic optical fiber **400** in the state in which the distal end of the tube **200** is positioned at the desired position.

[0056] Also, the catheter navigation system of the present invention includes a drug supply unit **600** which is built in the tube **200** to supply a drug into the inside of the human body.

[0057] The drug supply unit **600** includes a drug feed tube **610** which is built in the tube **200** to discharge the drug to be fed from the exterior through a distal end thereof, a drug pump **620** for pumping and feeding the drug to the drug feed tube **610**, a body status measuring member **630** for measuring the status of the human body, and a pump operating member **640** which compares the status of the human body measured by the body status measuring member **630** and a preset reference value, and controls the operating speed of the drum pump **620** to adjust a supply amount of the drug according to the compared result.

[0058] The drug feed tube **610** is built in the other channel of the tube **200** to guide the drug fed from the exterior to the inside of the human body. In this instance, the drug may be a saline solution for washing the tissue of the human body to increase the visibility, or a remedy drug for treating the tissue of the human body.

[0059] The drug pump **620** can forcibly feed the prepared drug to the drug feed tube **610**.

[0060] The body status measuring member **630** may be a blood pressure sensor which is provided to the distal end of the tube **200** to be close to the drug feed tube **610**, so as to measure blood pressure of blood flowing in front of the distal end of the tube **200** inserted into the human body. Accordingly, the internal pressure of the human body can be measured by the body status measuring member **630**.

[0061] The pump operating member **640** may include a controller which can be operated by the user so as to allow the drug pump **620** to feed the drug. A reference value can be set to be slightly lower than the normal blood pressure measured in the human body of the patient, and can be arbitrarily set depending upon the status of the patient.

[0062] Accordingly, if the drug pump **620** is operated in the state in which the tube **200** is inserted into the inside of the human body, the drug is sprayed from the distal end of the tube **200** through the drug feed tube **610**, and thus the tissue of the human body positioned at the distal end of the tube **200** is washed, thereby securing the visibility of the plastic optical fiber **400** exposed from the distal end of the tube **200**. In this instance, since the blood pressure of the human body is measured by the body status measuring member **630**, the drug is sprayed at pressure lower than the blood pressure, on the basis of the measured blood pressure. Specifically, it is possible to wash the tissue of the human body, while minimizing the increase in internal pressure of the human body due to the drug to be sprayed.

[0063] As illustrated in FIGS. **6** to **8**, the catheter navigation system of the present invention includes a distance measuring member **700** for measuring a distance of a subject through the plastic optical fiber **400**, a grid frame **800** having a plurality of horizontal lines and a plurality of vertical lines which are spaced at regular intervals, and displayed on a screen of a monitor **10**, and a dimension calculating member **900** for measuring a dimension of the subject by use of the distance measured by the distance measuring member **700** and the grid frame **800**.

[0064] The distance measuring member **700** has a light emitting part **710** for emitting a light to the plastic optical fiber **400**, a light receiving part **720** for receiving the light emitted from the light emitting part **710**, irradiated onto the subject through the plastic optical fiber **400**, and then reflected from the subject, and a distance calculating part **730** for calculating a distance from the subject to the distal end of the plastic optical fiber **400** on the basis of the distance from the subject to the light receiving part **720** and a length of the plastic optical fiber **400** according to a light receiving state of the light receiving part **720**.

[0065] The distance calculating part **730** calculates the distance from the subject to the light receiving part **720**, and calculates a distance value from the subject to the distal end of the plastic optical fiber **400** from the calculated distance, except for the distance the length of the plastic optical fiber **400**.

[0066] The grid frame **800** may form the vertical lines and the horizontal lines on the screen of the monitor **10** in the shape of a checkerboard. In this instance, the interval of the vertical lines or the horizontal lines can be set by about 10 to 100 nanometers so as to accurately measure the size of a microscale tissue.

[0067] The dimension calculating member **900** has a grid recognizing part **910** for recognizing the horizontal lines and the vertical lines which are close to the outside of the subject enclosed by the grid frame **800**, a calculation part **920** for calculating the interval of the horizontal lines recognized by the grid recognizing part **910** as a horizontal value, and calculating an interval of the vertical lines as a vertical value, and a value adjusting part **930** for decreasing the horizontal value and the vertical value which are calculated by the calculation part **920** as much as the increased distance value measured by the distance measuring member **700**, or increasing the horizontal value and the vertical value which are calculated by the calculation part **920** as much as the decreased distance value measured by the distance measuring member **700**.

[0068] The grid recognizing part **910** recognizes the horizontal lines and the vertical lines which are positioned at the outermost periphery of the tissue of the subject.

[0069] The calculation part **920** calculates the interval of the horizontal lines and the interval of the vertical lines, such that the user can see the whole area.

[0070] Since the value adjusting part **930** is configured to adjust the horizontal value and the vertical value according to the increase or decrease in distance to be measured, the user can see the size of the tissue corresponding to the actual size. The value adjusting part **930** may be configured so that the horizontal value and the vertical value are displayed as numerals on the screen of the monitor **10**.

[0071] Accordingly, the interval c of the horizontal lines and the interval d of the vertical lines which are positioned at the periphery of the tissue displayed on the monitor **10** are decreased at the distance of the distal end of the plastic optical fiber **400** which is far away from the tissue of the subject. On the contrary, the interval e of the horizontal lines and the interval f of the vertical lines which are positioned at the periphery of the tissue displayed on the monitor **10** are increased at the distance of the distal end of the plastic optical fiber **400** which is close to the tissue of the subject. Therefore, the user can see the actual correct size of the tissue through the monitor **10**, which can be of help to the tissue inspection or treatment.

[0072] With the above configuration, since the drug introduction and the photographing can be carried out by use of one tube, the catheter is easy to use, and the inspection time can be shortened. Therefore, the present invention can be widely applied to the catheter.

[0073] While the present invention has been described with reference to the particular illustrative embodiments, it is not to be restricted by the embodiments but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

What is claimed is:

1. A catheter navigation system comprising:

a handle which is operated by a user;

a tube which is configured to be connected to the handle and is inserted into a human body;

a tube navigation unit which pushes one side of the tube while pulling the other side so as to bend the tube and thus navigate a direction of the tube;

a plastic optical fiber which is built in the tube to transmit a light, with one end of the plastic optical fiber being exposed from a distal end of the tube; and

a cap which is connected to the distal end of the tube to close the distal end of the tube.

2. The catheter navigation system according to claim **1**, wherein the tube navigation unit includes wires which are housed parallel to each other in the tube, with one ends of

the wires being fixed to the distal end of the tube, and the other ends being respectively positioned in the handle, and a wire operating unit which is connected to the other ends of the wires so as to pull one wire and push the other wire.

3. The catheter navigation system according to claim **2**, wherein the wire operating unit includes an operation handle which is connected to the other ends of the wires so as to pull or push one wire and push or pull the opposite wire, and a rotation support member which is provided to the handle so as to support swing movement of the operation handle.

4. The catheter navigation system according to claim **3**, wherein the wires are distributed and built in the tube in four directions, in which the end of the respective wires is fixed to the distal end of the tube, while the other end is connected to the operation handle in four directions, and

the operation handle has a ring-shaped body which is operated by the user, and protrusions which protrude inwardly from the body in four directions to fix the other ends of the wires, respectively.

5. The catheter navigation system according to claim **3**, wherein the rotation support member has a female-type rotation support portion for fixing the protrusions, and a male-type rotation portion to which the female-type support portion is connected to be able to rotate in four directions.

6. The catheter navigation system according to claim **1**, wherein the plastic optical fiber includes an optic angle enlarging portion for condensing an incident light so as to enlarge an angle of the light to be emitted, and

the optic angle enlarging portion is connected to an inlet side of the plastic optical fiber, and is formed in a funnel shape, of which an inlet for receiving a light illuminated from a light source is formed to be wider than an outlet for emitting the light.

7. The catheter navigation system according to claim **1**, further comprising a drug supply unit which is built in the tube to supply a drug into an inside of a human body, and

the drug supply unit including a drug feed tube which is built in the tube to discharge the drug to be fed from the exterior through a distal end thereof, a drug pump for pumping and feeding the drug to the drug feed tube, a body status measuring member for measuring a status of the human body, and a pump operating member which compares the status of the human body measured by the body status measuring member and a preset reference value, and controls operating speed of the drum pump to adjust a supply amount of the drug according to the compared result.

8. The catheter navigation system according to claim **7**, wherein the body status measuring member has a blood pressure sensor which is provided to the distal end of the tube to be close to the drug feed tube, so as to measure blood pressure of blood flowing in front of the distal end of the tube inserted into the human body.

9. The catheter navigation system according to claim **1**, further comprising

a distance measuring member for measuring a distance of a subject through the plastic optical fiber;

a grid frame having a plurality of horizontal lines and a plurality of vertical lines which are spaced at regular intervals, and are displayed on a screen of a monitor; and

a dimension calculating member for measuring a dimension of the subject by use of the distance measured by the distance measuring member and the grid frame,

the dimension calculating member having a grid recognizing part for recognizing the horizontal lines and the vertical lines which are close to an outside of the subject enclosed by the grid frame, a calculation part for calculating an interval of the horizontal lines recognized by the grid recognizing part as a horizontal value, and calculating an interval of the vertical lines as a vertical value, and a value adjusting part for decreasing the horizontal value and the vertical value which are calculated by the calculation part as much as the increased distance value measured by the distance measuring member, or increasing the horizontal value and the vertical value which are calculated by the calculation part as much as the decreased distance value measured by the distance measuring member.

* * * * *

专利名称(译)	导管导航系统		
公开(公告)号	US20170120004A1	公开(公告)日	2017-05-04
申请号	US14/958314	申请日	2015-12-03
[标]申请(专利权)人(译)	GSM KOREA		
申请(专利权)人(译)	GSM KOREA CO.，LTD.		
当前申请(专利权)人(译)	GSM KOREA CO.，LTD.		
[标]发明人	SHIN JUNG WON		
发明人	SHIN, JUNG-WON		
IPC分类号	A61M25/01 A61B5/00 A61B1/00 A61B34/20 A61B90/00		
CPC分类号	A61M25/0147 A61M25/0136 A61B34/20 A61M2025/015 A61B1/00165 A61B5/0084 A61M2230/30 A61B90/36 A61B1/00009 A61B1/0052 A61B1/0055 A61B1/0057 A61B1/015 A61B1/042 A61B1/0669 A61B1/07 A61B5/0215 A61B5/065 A61B5/1076 A61B5/1079 A61B5/6852 A61B2090/3614		
优先权	1020150153084 2015-11-02 KR		
外部链接	Espacenet USPTO		

摘要(译)

导管导航系统包括由用户操作的手柄（ 100 ）;管（ 200 ），其构造成连接到手柄（ 100 ）并插入人体;一个管导航装置（ 300 ）推动管的一侧（ 200 ），同时拉动另一侧以弯曲管（ 200 ）然后导航管的方向;塑料光纤（ 400 ），内置于管（ 200 ）中以传输光，塑料光纤的一端从远端露出管（ 200 ）;和一个帽子（ 500 ）连接到管的远端（ 200 ）以关闭管的远端（ 200 ））。