United States Patent

[11] 3,618,613

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[54] **ANTITHROMBOTIC INTRAVASCULAR CATHETER REINFORCED WITH NONKINKING MEANS**

1 Claim, 4 Drawing Figs.

[52] **U.S. Cl.** **128/348**
[51] **Int. Cl.** **A61m 25/00**

[50] **Field of Search** 128/348–351

[56] **References Cited**

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Primary Examiner—Dalton L. Truluck
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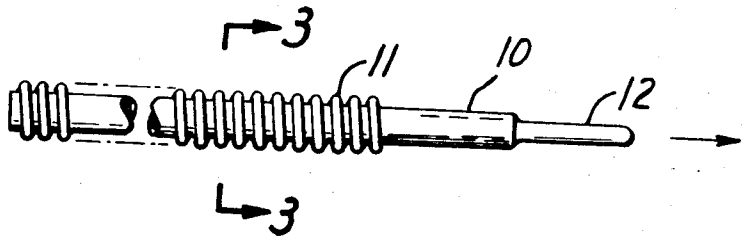
ABSTRACT: This invention relates to tubular catheters which are inserted through veins to enter the peritoneal cavity for medical purposes. Such tubing catheters have other medical applications such as for drainage or for introduction of medical materials, but since the tubing is of such a small diameter, it has been subject to difficulties in handling. The current invention circumvents problems caused by kinking during use by the application of a wire spring coiled around the tubing in interference fit and then coated with a silicone material to provide the surface finish required for insertion. The distal end of the catheter may be coated with an antithrombotic coating.



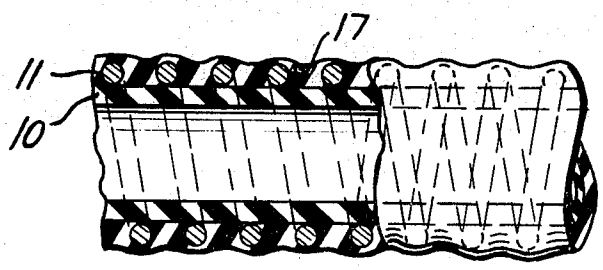


FIG. 1

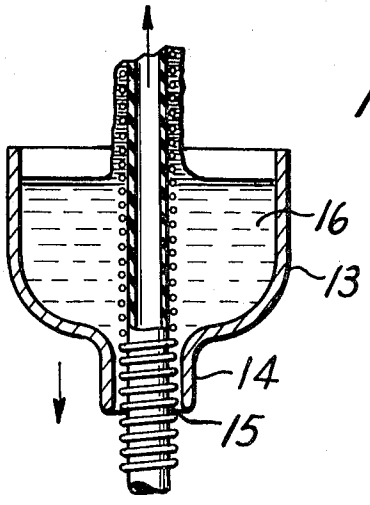


FIG. 4

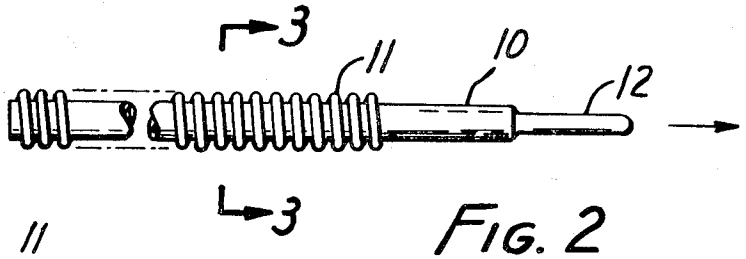


FIG. 2

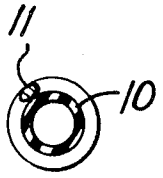


FIG. 3

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ANTITHROMBOTIC INTRAVASCULAR CATHETER REINFORCED WITH NONKINKING MEANS

DESCRIPTION OF THE INVENTION

This invention relates to surgical catheters.

An object of this invention is to provide a catheter for body implant, of small diameter, which will stand the stress of insertion through the veins or organs of a body.

Another object of the invention is to provide the tube-type catheter which can resist the stresses of insertion with kinking.

A further object of the invention is to provide tubing catheter which will not fail at the point where the tubing is applied to connecting devices.

Still another object of the invention is to provide tubing which will be self-guided into a vein and prevent kinking failure at its point of entrance.

Still another object of the invention is to provide a catheter which will curve over the muscles encountered during its course through the body without kinking.

A further object of the invention is to provide reinforced tubing that will be capable of penetrating muscles before entering body cavities without kinking or other mechanical failure.

Other objects and advantages of the instant invention will be shown by studying the figures and the description of invention, which follows:

FIG. 1 is a segment of an embodiment of the invention partially in cross section;

FIG. 2 is a side elevation of the embodiment of FIG. 1 before final coating;

FIG. 3 is a section on line 3—3 of FIG. 2; and

FIG. 4 shows the embodiment of the invention of FIG. 1 and FIG. 2 in process of final coating.

In FIG. 1 there is shown a preferred embodiment of the invention.

The tubing **10** is encircled by a continuous wire coil spring **11** which encircles the tubing in very close contact, preferably an interference fit, between the inside diameter of the the coil spring **11** and the outside diameter of the tubing **10**. The tubing **10** for this class of article is of very small internal and external diameter, in the range of one-sixteenth inch. In order to provide the interference fit, the tubing is made with an entrance probe, as seen in FIG. **2**. The entrance probe **12** may be conveniently formed on the tubing by thermoplastic means or may be a separate piece assembled to the tubing **10**.

In order to make a coil spring of diameter that will be in interference fit with the tubing **10**, the spring may be conveniently wound on a mandrel of larger diameter to form the coil and then elongated to provide the spacing of the coils and further to reduce the internal diameter of the coil spring **11**.

A convenient length of tubing **10** with entrance probe **12** at one end is gripped by the entrance probe **12** and pulled through the coil **11** with sufficient force to overcome the interference fit between coil **11** and the outside diameter of tubing **10**.

The tubing **10** is then suspended in air hanging from a fixture which engages entrance probe **12**. A container **13** having a spout **14**, the spout having an entrance hole **15**, is passed over the tubing to the uppermost end so that entrance hole **15** is in a downward direction and the entrance hole **15** is so designed that it is a close fit to the outside diameter of the coil spring **11**. The container **13** is then filled with a silicone material **16** which may conveniently be a silicone rubber of air-curing formulation. Silicone rubber is formulated to a viscosity which will cause it to cling to the exterior of the tubing **10** and fill the recesses between the coils of the spring **11** and form a coating **17** over said spring **11** and tubing **10** of the desired thickness. As the container **13** is allowed to move slowly downward over the tubing **10** and coil spring **11** assembly, the coated assembly of tubing **10** and coil spring **11** is then allowed to hang in air until the silicone material hardens to its final consistency.

One novel production method in assuring that the small diameter tubing may be pulled through in interference fit through the smaller internal diameter coil spring **11** is accomplished by fusing a cord or wire to the end of the tubing **10**, so that the outside diameter does not have to be increased by adding a gripping means for pulling through the coil spring **11**.

The distal end of the tubing, which is formed by the entrance probe **12** is coated with an antithrombotic coating, which may be of the nature of Hepacone, to prevent the formation of blood clots as the tubing is pulled through the body.

Thus it can be seen that a reinforced, small diameter tubing, which will not be subject to kinking and will not be reactive to the body fluids and is further provided with an entrance probe to permit passage through the body and a coating to prevent formation of thrombosis is provided by the instant invention, in accordance with the following claims.

I claim:

1. A surgical catheter comprising a flexible tubing made entirely of silicone rubber; an entrance probe integral with the flexible tubing and also made of silicone rubber, said entrance probe having a stepped-down outer diameter less than the outer diameter of the tubing and extending as a cylinder for a substantial distance; an antithrombotic coating of silicone rubber infused with heparin on said entrance probe; a flexible coil spring encircling and in interference fit with said tubing; and a surface coating of silicone rubber, once liquid and later cured to a solid, said coating fully covering the exposed surface of the spring and tubing and substantially filling in the interstices between convolutions of the spring.

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PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,618,613 Dated November 9, 1971

Inventor(s) RUDOLF R. SCHULTE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Patent

Col. 1,	lines 9-12	"stand the stress...with kinking" should be --withstand insertion and usage stresses without kinking--
	line 13	"tubing" should be --a tubular--
	line 14	"will not fail" should be --resist failure--
	lines 17-18	"self guided into a vein and prevent kinking failure" should be --self guiding as it enters into a vein and will resist kinking--
	lines 27-28	"shown by...which follows:" should be --evident from the following detailed description in the accompany drawings in which:--
	line 30	after "in" insert --axial--
	lines 31-32	after "before" insert --receiving its--
	line 33	after "section" insert --taken--
	line 35	after "of" insert --receiving its--
	line 36	"a" should be --the presently--
	line 38	"The" should be --A--
	lines 42-43	Cancel "internal and external"
	line 43	after "inch" and before the period, insert --inner diameter--

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(5/69)

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It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Patent (continued)

Col. 1,	line 44	"made" should be --provide--
	line 45	"seen" should be --shown--
	line 46	"conveniently" should be --integrally--
	line 46	Cancel "by thermoplastic means"
	line 47	"be" should be --constitute--
	line 50	Cancel "conveniently"
Col. 2,	line 2	after "pulled" insert --by it--
	line 11	"is" should be --makes--
	line 11	"to" should be --with--
	line 13	"which may conveniently be" should be --such as--
	line 14	"Silicone" should be --The silicone--
	lines 18-20	"As the container...tubing 10 and coil spring 11" should be --The container is moved slowly downward over the assembled tubing and coil spring, which causes this assembly to be coated with a layer of silicone. After this coating occurs, the coated article--
	line 23	"assuring that" should be --enabling--
	line 24	"may" should be --to--

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CERTIFICATE OF CORRECTION

Patent No. 3,618,613 Dated November 9, 1971

Inventor(s) RUDOLF R. SCHULTE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Patent (continued)

Col. 2,	lines 24-25	"in interference fit through" to --and fit tightly in--
	lines 25-26	"accomplished fusing...tubing 10," to --by attaching a cord or wire to the probe,--
	line 27	after "diameter" insert --of the tubing--
	line 28	after "11." insert --The cord or wire is passed freely through the spring, and is then used to pull the fusing through the spring.--
	line 31	"which may be of the nature of Hepacone" should be --such as a coating including heparin--
	line 37	change the comma to a period and cancel "in accordance with the following claims."
	line 38	Add the following paragraph: --This invention is not to be limited by the embodiment shown in the drawings and described in the description, which is given by way of example and not of limitation, but only in accordance with the scope of the appended claims.--

Signed and sealed this 9th day of January 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents