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[21] Appl. No. 735,022
[22] Filed June 6, 1968
[45] Patented Aug. 10, 1971

[54] CATHETER HAVING ANTIBACTERIAL
SUBSTANCE THEREIN PROVIDED WITH MEANS
PERMITTING SLOW RELEASE OF SAID
SUBSTANCE
6 Claims, 2 Drawing Figs.

[52] U.S. CL. 128/349,
128/260, 424/16, 424/21
[51] Int. Cl. A61m 25/00
[50] Field of Search 128/348-
—351, 325, 343, 214.4, 260, DIG. 21; 3/1;
138/118, 137, 138; 424/16, 19—23; 239/36, 145

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FOREIGN PATENTS

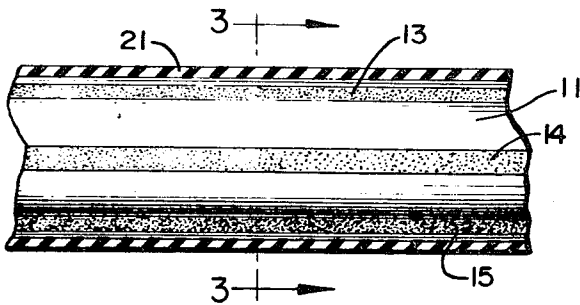
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ABSTRACT: A catheter has an inner tube of nonpermeable rubber formed with V-shaped grooves extending along its length on the outside carrying antibacterial agents permeable through polysiloxane rubber that surrounds the V-shaped grooves. The antibacterial agents are permeable through the polysiloxane rubber. Upon diffusion through the polysiloxane layer the antibacterial agents help prevent infection caused by bacteria moving up the tube toward the bladder or other organ into which the catheter tube leads.



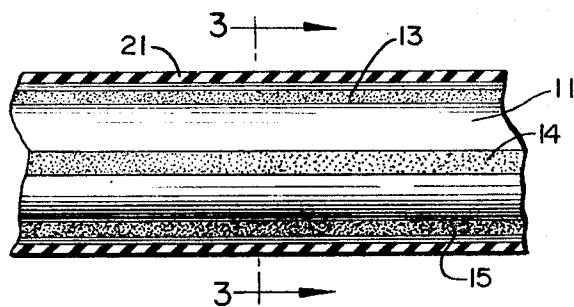


FIG. 1

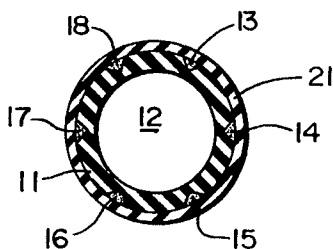


FIG. 2

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CATHETER HAVING ANTIBACTERIAL SUBSTANCE THEREIN PROVIDED WITH MEANS PERMITTING SLOW RELEASE OF SAID SUBSTANCE

BACKGROUND OF THE INVENTION

The present invention relates in general to catheters and more particularly concerns a novel catheter for reducing chance of infection developing in an organ, such as the bladder, to which a catheter tube leads from the outside of a patient.

It is known that bacterial count increases where a catheter enters the body. Thus, the presence of a catheter, often essential during the treatment of patients with certain conditions, increases the chances of the patient developing an internal infection. One possible approach toward reducing the chances of infection is to continuously have an attendant sponge the area where the catheter enters the body with an antibacterial agent. The shortage of personnel in hospitals makes this approach impractical.

Accordingly, it is an important object of this invention to reduce the chance of bacteria entering the body where a catheter is inserted.

It is another object of the invention to achieve the preceding object with a technique that requires negligible attention.

It is another object of the invention to achieve the preceding object over relatively long periods of time.

It is another object of the invention to achieve the preceding objects with a structure that is relatively easy and inexpensive to fabricate and does not appreciably increase the outside diameter of the catheter.

SUMMARY OF THE INVENTION

According to the invention, first means defines a hollow tube made of material that is impermeable to bacterial agents, such as rubber surrounded by means defining an outer layer of material permeable to an antibacterial agent between the first and second means. Typically, the second material is polysiloxane rubber. Typical antibacterial substances suitable for use include neomycin, bacitracin, sulfa, mandelamine, zepheran, hexachloraphine, and furadantoin.

Other features, objects and advantages of the invention will become apparent from the following specification when read in connection with the accompanying drawing in which:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view of a portion of a catheter according to the invention with the outer layer in section; and

FIG. 2 is a sectional view through section 2-2 of FIG. 1.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

With reference now to the drawing and more particularly FIGS. 1 and 2 thereof a catheter tube according to the invention comprises an inner layer of nonpermeable rubber 11 that defines a hollow fluid passage 12 through which fluids may be withdrawn from the patient. Inner rubber tube 11 may be formed with a number of V-shaped grooves 13-18, each filled with an antibacterial substance having the property that the permeability of the substance through polysiloxane rubber is much greater than through the nonpermeable rubber of inner tube 11. Examples of such antibacterial substances are neomycin, bacitracin, sulfa, mandelamine, zepheran, hexachloraphine, and furadantoin. The antibacterial substance in the V-shaped grooves is then sealed by an outer tube 21 of polysiloxane rubber sold under the trade name Silastic.

The following tests have been conducted: First, to demonstrate that antibacterial agents will go through layer 21 of polysiloxane rubber, Silastic capsules constructed of hollow Silastic tubing were sealed at each end to enclose the above-identified antibacterial substances inside respective ones of the capsules while control capsules were not filled with an-

tibacterial substances. The filled capsules along with the control capsules were placed in separate tubes of saline. After a 7-day equilibration, small samples of the fluid were placed on pieces of filter paper. These pieces were then placed on blood-agar culture plates which previously has been inoculated with bacteria (bacteria obtained from urine of patients with infections). No inhibition of bacterial growth occurred around the control discs while a zone of inhibition appeared around the neomycin disc. These tests demonstrate that antibacterial agent passed through the Silastic membrane of the capsule in concentrations great enough inhibit bacterial growth. Thus, apart from its utility as a catheter, the invention has independent utility for slowly dispensing antibacterial substance into a region adjacent the outside of the Silastic tubing to inhibit the growth of bacteria.

The second experiment was similar to the first except that thin slices of the wall of the capsules were placed on the bacteria-inoculated plates. Similar inhibition occurred indicating that the Silastic membrane was able to hold the drug, much like a sponge holds water, and then diffuse it from its surface.

There has been described a novel antibacterial substance dispenser, in one form a catheter for reducing infection and/or inhibiting bacteria growth over a long period of time without attention at relatively low cost with a simple structure that negligibly, if at all, increases the diameter of the catheter tube when embodied in that form. It is evident that those skilled in the art may now make numerous uses and modifications of and departures from the specific embodiments described herein without departing from the inventive concepts. For example, the V-shaped grooves could be omitted and the catheter comprise a nonpermeable rubber inner tube surrounded by a Silastic outer tube that is permeated with antibacterial agent introduced by soaking such a tube in an antibacterial substance until the Silastic outer tube absorbs enough substance to provide the desired degree of bacterial inhibition over the desired length of time. Other antibacterial substances and tube materials may be employed so long as the relationship between the antibacterial substance, inner tube and outer tube is such that the inner tube is substantially nonpermeable to the antibacterial substance and the outer tube is substantially permeable to the antibacterial substance. Therefore, invention is to be construed as embracing each and every novel feature and novel combination of features present in or possessed by the apparatus and techniques herein disclosed and limited solely by the spirit and scope of the appended claims.

What I claim is:

1. A catheter containing an antibacterial substance for insertion into the body comprising an elongate outer hollow tube permeable to an antibacterial substance for slowly dispensing said antibacterial substance therethrough after insertion into the body,
- an elongate inner tube coextensive with and concentric within said outer tube immediately adjacent thereto and made of material substantially nonpermeable to said antibacterial substance,
- and means containing said antibacterial substance positioned on the outside of said inner tube immediately adjacent to the inside of said outer tube.
2. A catheter tube in accordance with claim 1 wherein said outer tube is made of polysiloxane rubber.
3. A catheter tube in accordance with claim 2 wherein said antibacterial substance comprises a substance in the group comprising neomycin, bacitracin, sulfa, mandelamine, zepheran, hexachloraphine, and furadantoin.
4. A catheter tube in accordance with claim 1 wherein said outer tube is made of polysiloxane rubber and said inner tube is made of rubber nonpermeable to said antibacterial substance.
5. A catheter tube in accordance with claim 1 wherein said means containing said antibacterial substance comprises at least one longitudinal groove formed in said inner tube immediately adjacent to said outer tube,

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said antibacterial substance residing in said at least one groove.

6. A catheter tube in accordance with claim 4 wherein said

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antibacterial substance comprises a substance from the group comprising neomycin, bacitracin, sulfa, mandelamine, zepheran, hexachloraphine, and furadantoin.

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