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# United States Patent [19]

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Mahurkar

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## [54] REINFORCED MULTIPLE-LUMEN CATHETER AND APPARATUS AND METHOD FOR MAKING THE SAME

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[\*] Notice: The portion of the term of this patent subsequent to Jun. 22, 2010 has been disclaimed.

[21] Appl. No.: **55,830**

[22] Filed: **Apr. 28, 1993**

### Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 776,873, Oct. 16, 1991, Pat. No. 5,221,244, which is a continuation of Ser. No. 463,285, Jan. 10, 1990, abandoned, and a continuation-in-part of Ser. No. 903,896, Jun. 25, 1992, abandoned.

[51] Int. Cl.<sup>5</sup> ..... **A61M 25/00**

[52] U.S. Cl. .... **604/43; 604/281**

[58] Field of Search ..... **604/43-45, 604/264, 280, 281, 282**

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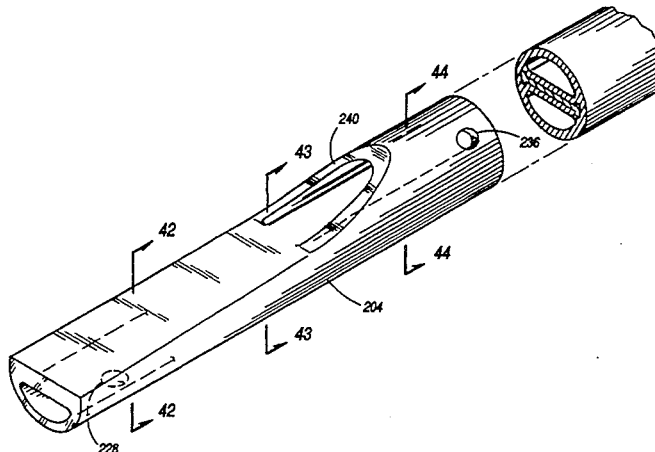
Primary Examiner—Ralph A. Lewis  
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### [57] ABSTRACT

A method of making a multiple-lumen catheter using a co-extrusion die comprises the step of forming an elongated cylindrical tube made of silicone and having an internal septum extending along the length thereof to form at least a pair of longitudinal lumens. While the elongated cylindrical tube is being formed, a nylon reinforcing strip is arranged inside the tube such that the strip extends along the length of the tube. The tube is solidified and cut into individual multiple-lumen catheters. The nylon strip includes a pair of orthogonal side plates which aid in anchoring the nylon strip within the solidified tube.

An apparatus for making the multiple-lumen catheter comprises a co-extrusion die, a silicon extruder for injecting silicone into the die, and a pair of rollers for feeding a nylon strip into the die. The co-extrusion die has a circular opening containing a pair of mandrels extending within the die for a predetermined length, the mandrels being arranged substantially parallel to each other with a gap therebetween. The rollers feed the nylon strip into the gap between the mandrels while the extruder is injecting the silicone into the die.

19 Claims, 17 Drawing Sheets



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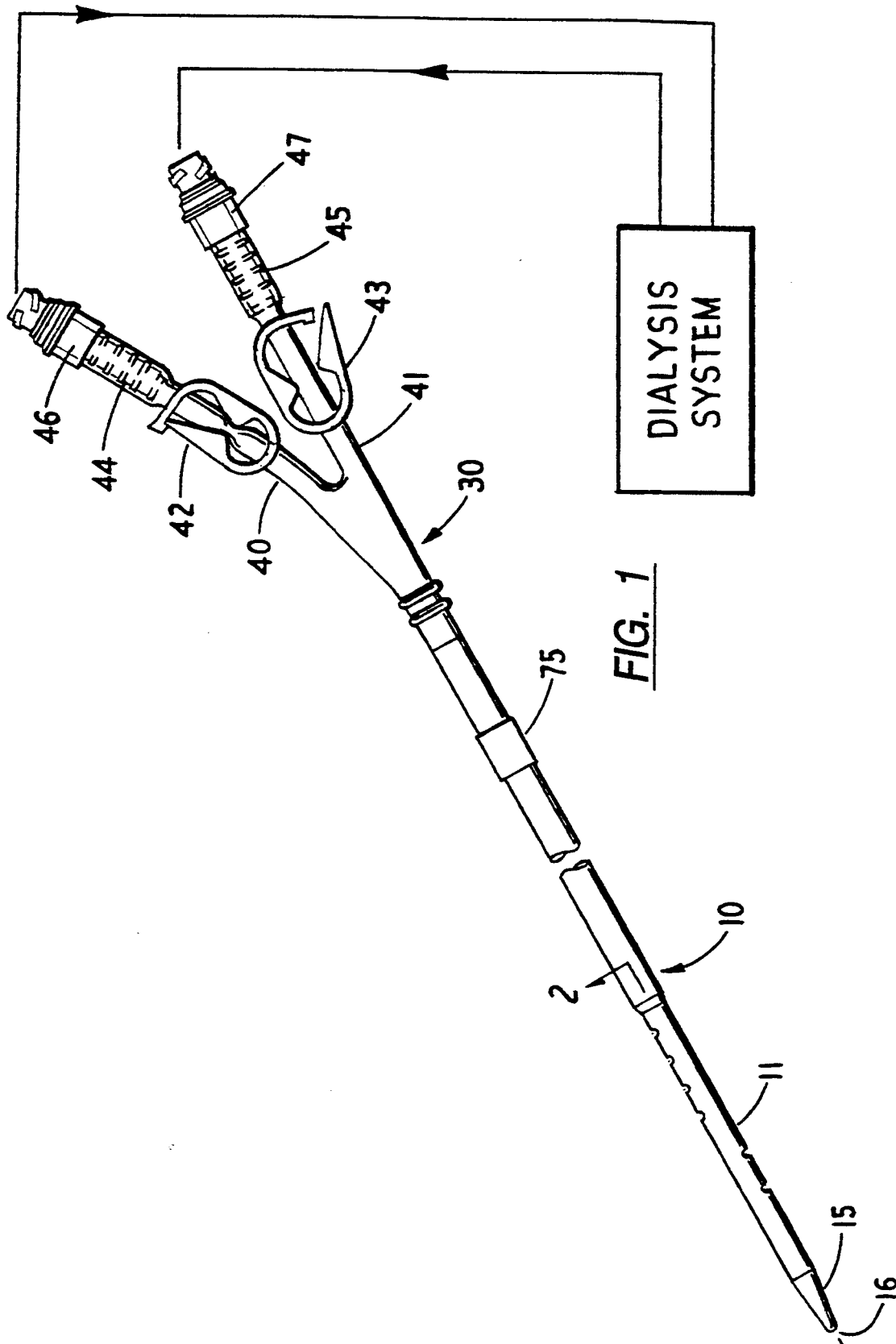


FIG. 1

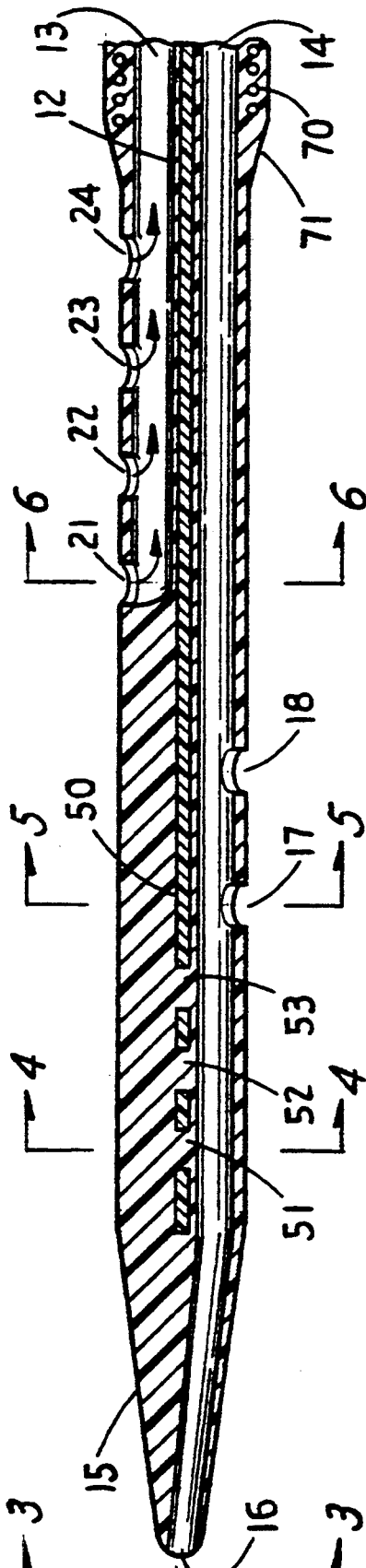


FIG. 2

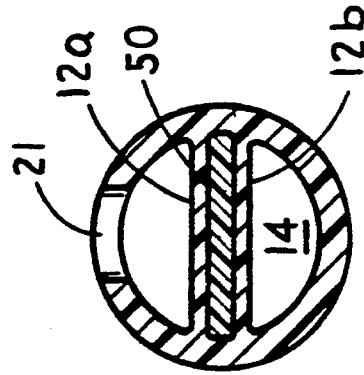


FIG. 3

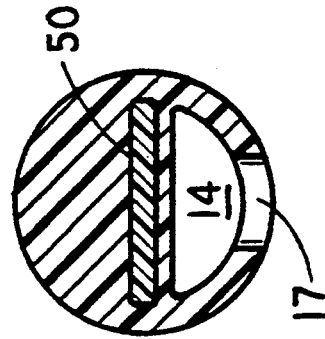


FIG. 4

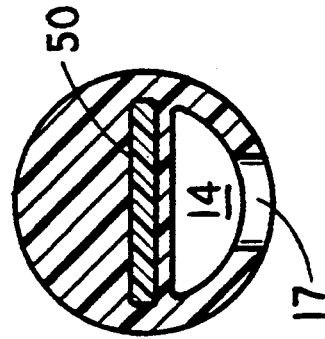


FIG. 5

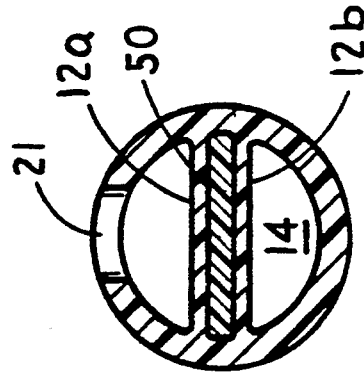


FIG. 6

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