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J. M. AUZIN
METHOD AND APPARATUS FOR MANUFACTURE OF
BALLOONS FOR INFLATABLE CATHETERS
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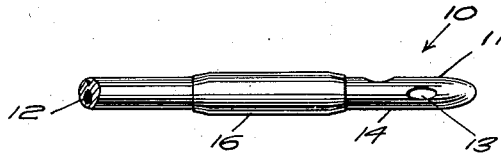


Fig. 1

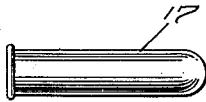


Fig. 2

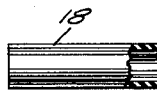


Fig. 3

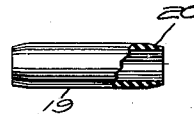


Fig. 4

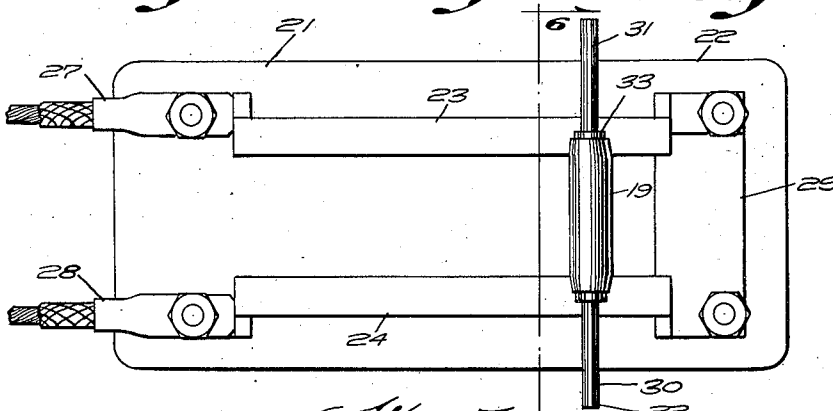


Fig. 5

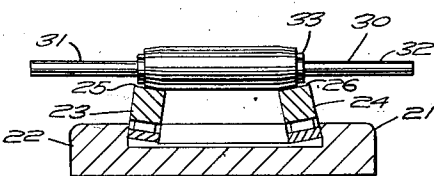


Fig. 6

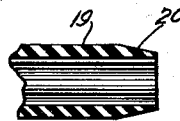


Fig. 7

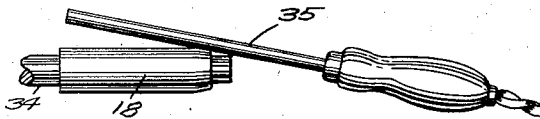


Fig. 8

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METHOD AND APPARATUS FOR MANUFACTURE OF BALLOONS FOR INFLATABLE CATHETERS

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Application July 20, 1945, Serial No. 606,257

2 Claims. (Cl. 18-2)

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The present invention relates to the manufacture of inflatable surgical catheters, and has particular reference to the manufacture of balloons therefor.

The principal object of the invention is to provide an improved balloon for an inflatable catheter.

Another object of the invention is to provide a novel apparatus for shaping the balloon ends.

With the above and other objects and advantageous features in view, the invention consists of a novel article of manufacture, a novel method of manufacture, and a novel apparatus, more fully disclosed in the detailed description following, in conjunction with the accompanying drawing, which illustrate a preferred arrangement for carrying out the invention.

In the drawings:

Fig. 1 is an enlarged end of an inflatable catheter of standard shape, showing the inflatable balloon;

Fig. 2 is a view of a balloon blank after dipping and curing;

Fig. 3 is a view of the blank of Fig. 2, the ends being cut off;

Fig. 4 is a view of Fig. 2 after the ends have been tapered;

Fig. 5 is a top plan view of a novel apparatus for tapering the balloon ends;

Fig. 6 is a section on the line 6-6 of Fig. 5;

Fig. 7 is an enlarged view of a balloon end, showing the final shape; and

Fig. 8 is a view showing tools for tapering the balloon ends by hand.

It has been found desirable to preform the balloons for inflatable catheters and to then seat the balloons on the catheter distal ends, instead of forming the balloons integrally with the catheters. The preforming operation permits testing each balloon before mounting, thus eliminating faulty inflatable catheters and reducing manufacturing costs. I have found it feasible to also shape the ends of the preformed balloons so that the finished catheter is very smooth and has no sharp or projecting edges which might interfere with the introduction of the catheter into a body cavity, or might cause pain or distress the patient by rubbing against irritated or diseased tissue.

To this end, I first form a tube, preferably by dipping a suitable mold into natural or synthetic rubber solution, such as latex. The formed tube is then removed, and the ends are cut off to provide a balloon blank of the desired length; the ends are then finely tapered so that no up-

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standing edges or ridges result when the balloon is mounted on the catheter body.

Referring to the drawings, the inflatable catheter 10 has a body portion 11 provided with a longitudinal flow passageway 12 which communicates with one or more terminal eyes or openings 13 in the body wall 14 at the distal end. An inflation passage 15 is provided in the wall 14 and communicates with the interior of the inflatable balloon section 16, in the usual manner.

The balloon section is formed separately, preferably by first dipping a suitable mold in rubber solution to form a tube 17, see Fig. 2, which is cured, stripped, tested and then cut at the ends, as indicated at 18 in Fig. 3, to provide a balloon blank 19. The ends of the balloon blank are then finely tapered, as indicated at 20 in Fig. 4, to form a balloon section ready for assembly to the catheter body.

Since an even fine taper is desired for the balloon section ends, it is preferred to burn the ends by means of a suitable apparatus such as is shown in Figs. 5 and 6. The end shaping apparatus 21 includes an insulated base 22 on which two metal tracks 23, 24 are mounted in spaced parallel relation, the upper surfaces 25, 26 of the tracks being inclined towards each other as illustrated in Fig. 6.

Electrical leads 27, 28 are connected to the metal tracks at one end, and a metal bar conductor 29 connects the other ends of the tracks, so that the tracks are uniformly heated throughout their length. A roller 30 is provided, having two outwardly extending circular ends 31, 32 and a central circular body 33, the balloon blank 19 being mounted on the circular body 33 and the roller 30 then being rolled over the heated tracks. This smoothly burns off the ends of the balloon blank to form finely tapered ends, due to the predetermined fixed inclination of the track faces 25, 26 to the axis of the roller 30, whereby the ends of the balloon blank are shaped as illustrated in Fig. 7. The blank is preferably shorter than the width of the tracks, so that the blank cannot be burned through but only burned in a taper at the ends by the contact of the circular body 33 with the tracks. The voltage should be low and the amperage high to obtain the desired heating effect, and a transformer and rheostat (not shown) may be used to reduce line voltage and increase the amperage.

The balloon section is now ready for securing to the catheter body.

If a special length of balloon section, or a special catheter size is desired, it is feasible to

provide a support cylinder 34, see Fig. 8, on which the balloon blank is mounted, and to use a heated hand tool 35 of cylindrical rod shape at the proper inclination to the cylinder 34 and its blank to burn off a suitable end taper on the balloon blank.

Although I have described a desirable manner of forming a separate balloon section for an inflatable catheter, and have described suitable apparatus for obtaining the desired tapered ends for the separate balloon section, it is obvious that changes in the desired shape, size, and arrangement of the parts and in the end shaping apparatus may be made to correspond to any tubular rubber section required by catheter or other instrument design, within the spirit and the scope of the invention as defined in the appended claims.

I claim:

1. The method of manufacturing a separate balloon section for an inflatable catheter, comprising the steps of forming a tube of rubber, cutting the ends to provide a tubular element of desired length, mounting the tubular element on a cylindrical shaft, and rotating the mounted tubular element over spaced aligned heated

tracks in right angle relation to the tracks, said tracks being inclined to the axis of the mounted tubular element.

2. Apparatus for tapering the ends of a tubular element formed of rubber, comprising two spaced parallel tracks having plane element engaging surfaces inclined towards each other, and means for heating the tracks.

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