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NASA TECH BRIEF

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Dip Molding To Form Intricately-Shaped Medical Elastomer Devices

The problem:

Implantable medical devices are often made in intricate shapes. The devices are mostly formed from delicate organic materials to make them compatible with living tissue. In some instances they have to be flanged. Conventional methods, such as thermal forming, spray forming, or dip molding, have not produced flanged devices with consistently good quality. Also the materials used are often incompatible with the durability characteristics of the specialized biomedical polymers.

The solution:

Medical devices with well-defined flanges can be made using a newly-developed dip molding process. Experimental cardiac-assist pumps have been made this way.

How it's done:

A solid mandrel is preshaped to form a device of the necessary geometry. The mandrel (see Figure 1), mounted on a rotating mechanism, is partially immersed in a tank filled with a liquid elastomer. While the mandrel is rotating, the elastomer film forms on the mandrel surface due to the surface tension and capillary behavior of the liquid.

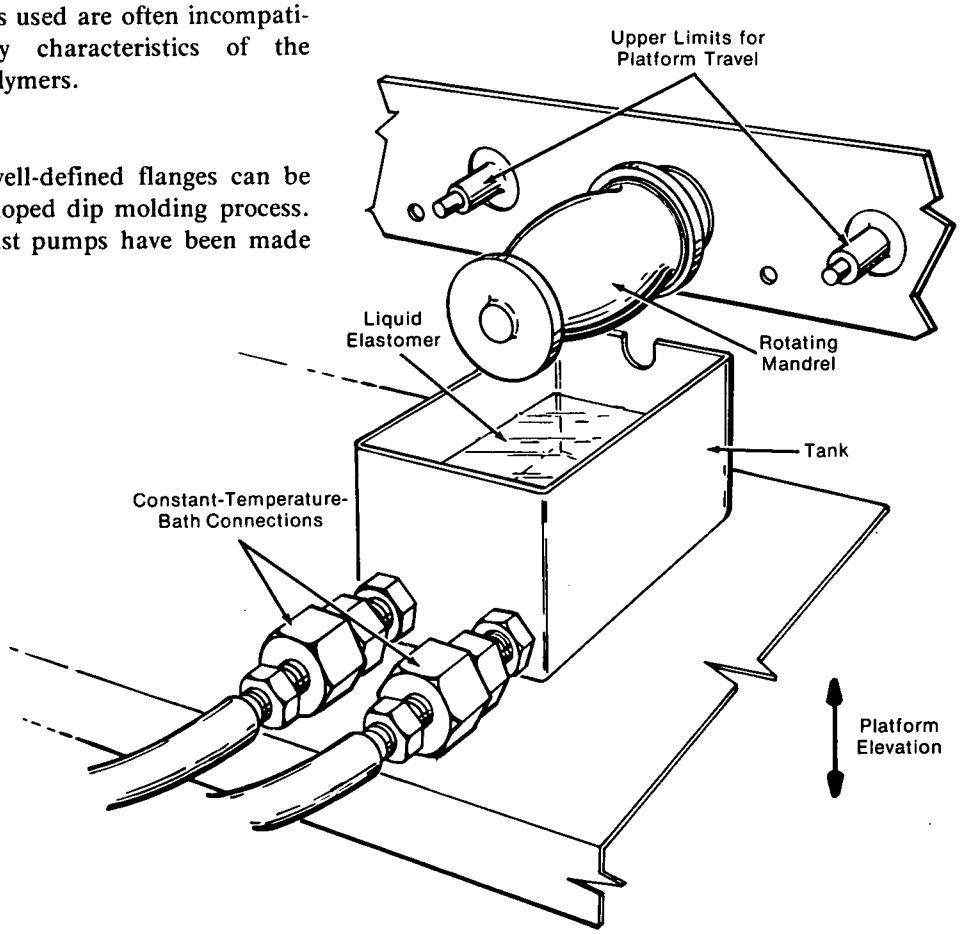


Figure 1. Setup for New Dip Molding Process

(continued overleaf)

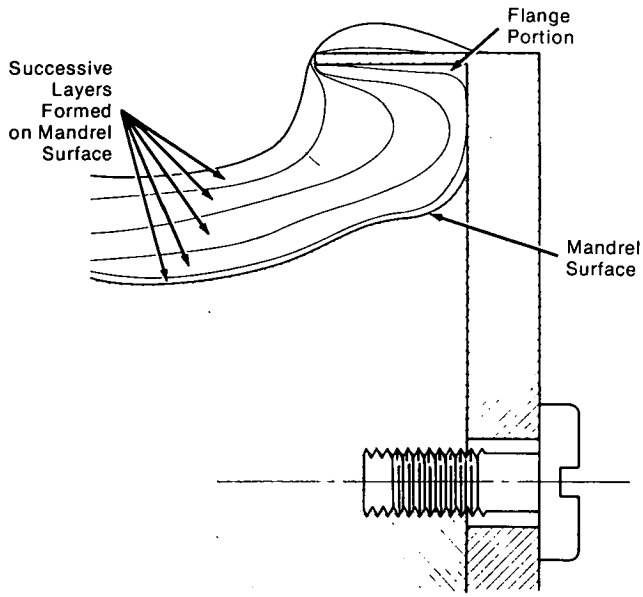
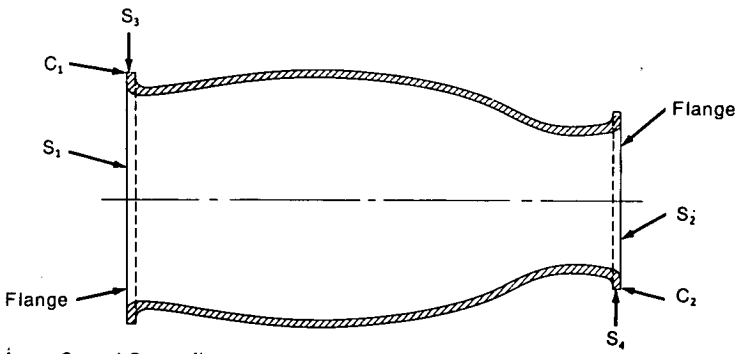


Figure 2. Formation of Layers



Note: Surfaces S_1 and S_2 are flat
Surfaces S_3 and S_4 are cylindrical
Corners C_1 and C_2 form sharp 90°

Figure 3. Cross Section of Polyurethane Bladder Made With New Dip Molding Process

Successive layers of film (see Figure 2) are built up by repeatedly immersing the mandrel for a certain period and then lifting it out of the tank for solvent phase evaporation and/or curing. The finished product is a tubular-shaped object as shown in Figure 3. It has two well-defined flanges forming sharp 90° corners.

Note:

Requests for further information may be directed to:

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Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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