# NASA TECH BRIEF

*NASA Pasadena Office*



## Implantable Prosthetic Pump Boosts Blood Pressure: A Concept

**The problem:**

Cirrhosis of the liver kills 22,000 people each year in the United States alone. The disease causes scar tissue which restricts the blood supply through to the organ and death may occur from toxic products in the blood not being filtered out. At the present time, the scar tissue cannot be corrected by surgery or drugs.

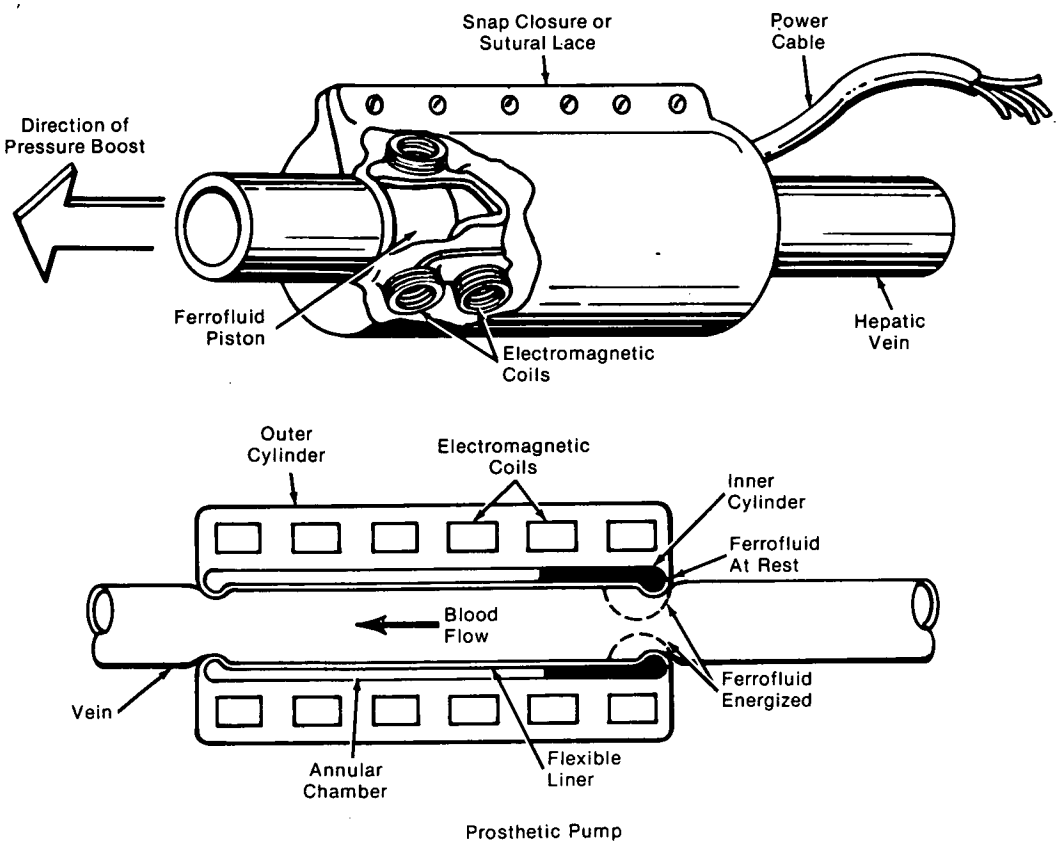
**The solution:**

A new prosthetic pump is proposed which can improve the liver blood supply by boosting the blood pressure locally to the organ.

**How it's done:**

A cross section of the pump is shown in the illustration. The outer element of the pump is a rigid hollow cylinder made of a biocompatible polymeric material. A series of electric coils is embedded along the length of the cylinder. Beneath the coils a small hollow cylinder contains a colloidal suspension of magnetic particles (ferrofluid). This cylinder is rigidly attached to the structure. Its inner surface is a flexible membrane-type material.

The pump is opened up along its length into two semicylindrical shells and is placed on a hepatic vein




Prosthetic Pump

(continued overleaf)

approximately 5 cm away from the liver. It then is closed by either a snap closure or sutural lace, completely wrapping around the vein section.

Blood pressure is boosted by applying power to each ring set of coils in sequence in the direction of the flow. When power is applied to the first set of coils, the ferrofluid contained in the inner cylinder bunches up in that area, compressing that vein section. Next, the second set of coils is energized, and the first set is deenergized; the ferrofluid bunch moves forward to compress the next vein section. The process is continued along the pump length, pushing the blood flow forward. This is done repeatedly, always starting with the first coil set.

The pump has several important features. First, the vein does not have to be cut for the installation. Second, the blood does not contact any prosthetic material. Third, any heat generated by the pump is dissipated in the bloodstream. Finally, there are no concentrated pressure points, and hence a potential cause of blood cell damage is eliminated.

The pump may be used to boost blood pressure to other organs as well. However, more testing is needed to make sure that the pump is compatible with the veinal blood flow.

**Note:**

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B75-10177

**Patent status:**

NASA has decided not to apply for a patent.

Source: John W. Fish of
Caltech/JPL
(NPO-13626)

Categories: 05 (Life Sciences)
06 (Mechanics)
01 (Electronics - Components and Circuitry)