



Aorta implanted micro turbine voltage powered internal pacemaker without replacement – a Prototype

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Abstract - In the past few years electronic pacemaker systems have become extremely important in saving and sustaining the lives of cardiac patients whose normal pacing functions have become impaired. Depending on the exact nature of the cardiac dysfunction, a patient may require temporary artificial pacing during the course of treatment or permanent pacing in order to lead an active, productive life after treatment. Heart block occurs when the system fails to transmit the pacing pulses from the atria to the ventricles. These heart blocks are normally differentiated as first, second and third degree blocks. And in case of any heart blocks the patient has to be treated with the pace making devices either temporarily or permanently. In case of permanent pace making unit the system comes with a pre fitted battery and circuits. The battery life lasts for 2 – 7 years (approx) and at the end of the battery life time the entire pace maker has to be removed and changed by surgery which is a tedious and a cost involving procedure. In order to overcome the problems relating to the replacement of the pacemaker by surgery, 'The Aorta Implanted Micro Turbine Voltage powered Internal Pacemaker without Replacement' proposes a method to harness the voltage required by the pace maker to produce the pacing pulses from the human body itself.

I.MICRO TURBINE

A micro turbine, having a mini armature surrounded by the bi poles of a permanent magnet along its core arm radiating outward is placed to the center of the core having four cupped blades attached to the rim of the core attached to the armature. The micro turbine will be the voltage production unit of the pace maker system. The complete turbine system is made of corrosion free metal, preferably titanium.

II.FUNCTIONALITY AND ASSEMBLY OF THE MICRO TURBINE

The main function of the micro turbine is to produce the required voltage for the pacemaker to produce the pacing pulses.

The turbine is installed into the aorta, the largest artery in the human body. The turbine is installed in such a way that only the rim and the blades are placed inside the artery, and the rest of the arrangements including the rim and the shaft consisting the armature and the bi poles of the magnet are positioned outside the aorta.

The incision made in the aorta to place the turbine is sealed with laser. In order to prevent moving, from the position of installation the turbine is placed inside a metallic balloon (preferably a stent) to ensure it remains in its position properly. The voltage produced by the turbine is varied according to the function by varying the no of coils, the proximity of the wounds in the armature and the strength of the magnet provided.

With respect to the direction of the blood flow, the micro turbine is positioned in a manner that the cupped blades of the turbine face the real flow of the blood and rotates. The natural flow of the blood and its pressure over the cupped faces rotates the blades of the micro turbine through its axis.

III.WORKING

As the blades of the turbine rotate with the pressure of the blood over its cupped faces, it forces the armature connected with the blades to rotate, as they are connected axially. As the armature rotates it produces an alternating voltage as the armature is placed in the strong fields between the bi poles of the magnet.

The primary aim of the micro turbine and the armature coil arrangement is the production of this alternating voltage. This alternating voltage is used to voltage the pace maker in order to eliminate the use of batteries. Eliminating the use of external batteries ensures that the pace maker is one time installed and thereby minimizing the cost and time involved in the re installation of batteries and the process of surgery for the same.

The pace maker can work only with a direct voltage and so the alternating voltage produced is to be converted into a direct voltage. So the produced alternating voltage is fed to a rectifier circuit. A rectifier circuit converts the alternating voltage into a direct voltage. Here any bridge circuit can act as a rectifier to produce the needed direct voltage.

The direct voltage now produced by rectifying the alternating voltage produced by the micro turbine is the voltage that is required to voltage the pace maker. Thus the voltage required to voltage the pace maker is produced from the patient's body itself.

Now the pace maker produces the pacing pulses and they are carried away to the SA node by means of wires. There the pacing pulses are applied to the SA node and the heart starts the pacing once again. The normal activity of the heart is ensured by the repeated activity of the internal pace making unit.

IV.CONCLUSION

Thus the power needed to operate the pace maker is harnessed from the body of the patient itself. Firstly the micro turbine rotates with the pressure applied over it by the bloods flow and produces the alternating voltage, and then the produced alternating voltage is converted into a direct voltage by passing the produced alternating voltage through a voltage rectifier circuit. Thus produced direct voltage is passed down to the pace maker. The pace maker produces the needed pacing pulses. The pacing pulses are applied to the SA node by means of normal wires. Thus the heart is kept pacing without the need of any external batteries. The functionality of the battery is replaced by the micro turbine and the armature - magnet arrangements. Thus the micro turbine along with the armature- magnet is the power house of the pace maker. Thus the internal powered pace maker makes itself look the most reliable method to produce pacing pulses to pace the heart at its normal rate of 72 beats per minute and also proves to be the most efficient and economic method.

V.ADVANTAGES

- The power needed to produce the pacing pulses of the pace maker is harnessed from the patient's body itself.
- It is a one time process, that is the pace maker has to be installed only once.
- The cost of the entire process is completely reduced because the batteries need not be replaced every 2 – 7 years.
- The process of surgery is done only once while the first time of pace maker installation, thereby it reduces the fear of infections due to multiple openings.
- There is no fear of heat being produced by the micro turbine as it is placed in the nerve and blood acts as a natural coolant carrying away the heat produced if any.