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A Theoretical Approach of Tesla Pump

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Abstract : This paper aims to study Tesla pumps for circulating biofluids. It is desired to make a small pump for the circulation of biofluids. This type of pump will be studied because it has the following characteristics: It doesn't have blades which results in very small frictions; Reduced friction forces; Low production cost; Increased adaptability to different types of fluids; Low cavitation (towards 0); Low shocks due to lack of blades; Rare maintenance due to low cavity; Very small turbulences in the fluid; It has a low number of changes in the direction of the fluid (compared to rotors with blades); Increased efficiency at low powers.; Fast acceleration; The need for a low torque; Lack of shocks in blades at sudden starts and stops. All these elements are necessary to be able to make a small pump that could be inserted into the thoracic cavity. The pump will be designed to combat myocardial infarction. Because the pump must be inserted in the thoracic cavity, elements such as Low friction forces, shocks as low as possible, low cavitation and as little maintenance as possible are very important. The operation should be performed once, without having to change the rotor after a certain time. Given the very small size of the pump, the blades of a classic rotor would be very thin and sudden starts and stops could cause considerable damage or require a very expensive material. At the same time, being a medical procedure, the low cost is important in order to be easily accessible to the population. The lack of turbulence or vortices caused by a classic rotor is again a key element because when it comes to blood circulation, the flow must be laminar and not turbulent. The turbulent flow can even cause a heart attack. Due to these aspects, Tesla's model could be ideal for this work. Usually, the pump is considered to reach an efficiency of 40% being used for very high powers. However, the author of this type of pump claimed that the maximum efficiency that the pump can achieve is 98%. The key element that could help to achieve this efficiency or one as close as possible is the fact that the pump will be used for low volumes and pressures. The key elements to obtain the best efficiency for this model are the number of rotors placed in parallel and the distance between them. The distance between them must be small, which helps to obtain a pump as small as possible. The principle of operation of such a rotor is to place in several parallel discs cut inside. Thus the space between the discs creates the vacuum effect by pulling the liquid through the holes in the rotor and throwing it outwards. Also, a very important element is the viscosity of the liquid. It dictates the distance between the disks to achieve a lossless power flow.

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