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EINHEIT ZUR SIMULATION EINES HERZENS

Introduction: The goal of this project has been to develop a prototype of a pneumatic drive system for two VAD-ventricles. The pneumatic entity serves as the drive of the biventricular system of an artificial cardiac patient. The drive's novelty is that it is freely programmable. As conventional drivers for pulsatile diaphragm ventricles, as used in the human medicine, are life-sustaining systems they can only simulate the normal cardiac function. The system has been realized with pressure reducers and circulatory valves. The artificial patient is a mobile unity which is used in various labours. As not all labours dispose of an in-house vacuum connection the pneumatic entity has an internal vacuum pump which can be activated or deactivated as necessary. The activation of the pneumatic unity has been realized with LabVIEW.

Functioning: The pneumatic entity drives the diaphragm through negative and positive air pressure. The pressure reducer regulates the form which rests on the volume flow valve. Valve one and three control the positive air pressure and valve two and four control the negative air pressure. When valve one and three open up the air compresses the diaphragm. In this way liquidity is driven out on the other side of the diaphragm. Now valve one and three close whereupon valve two and four open up. Now the vacuum sucks in the diaphragm of the ventricle whereby new liquidity is sucked in on the other side of the ventricle.

Conclusion: The pneumatic entity works and it runs reliably on the continuous use. Through appropriate activation of the valves it is now possible to proceed the heartbeat in different velocities and to simulate various cardiac arrhythmia. Through the knowledge which has been gained through the calculations especially through the derivation specific to the problem, all important parameters of the pneumatic entity such as the desired length and the diameter of the hose as well as the size of the ventricle and its anticipated throw-off time can be inserted. In this way the desired pressure, which should arise at the ventricle can be calculated. Therefore the software program of LabVIEW which drives the pneumatic entity can be optimally adjusted.