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THE CONCEPT OF PERPETUUM MOBILE
– FROM THE PAST TO THE PRESENT

Abstract: The article contains an explanation of the perpetual movement concept and description of practical solution which is based on the idea of motion that continues indefinitely without any external source of energy. There was also described, how NX 7.5 program was used in order to prepare 3D models of such a mechanism and carry out simulations of components movement within the framework of the scientific group research.

1. Introduction

This study includes an outline of the perpetual movement concept and contemporary interpretation of this issue. The paper is focused on a gravity engine. Preserved since the eighteenth century information about this concept was cited in the article. The description of free-piston engine patent from 80's of twentieth century and the analogy with the existing mechanisms were also presented. On that basis, the simplified 3D model of the engine and detailed one were prepared in NX 7.5 program by the scientific group 'Methods of computer-aided design and manufacturing'. What's more, simulations of engine's working (pistons movement) were carried out.

2. The perpetuum mobile concept

Perpetuum mobile is defined as a hypothetical machine which, once activated, would run forever. Its working would violate the fundamental laws of physics. One of the perpetual motion machines classifications refers to the particular law of thermodynamics which such a machine would violate:

− A perpetual motion machine of the first kind would do the work without absorption of external energy. Thus, it would violate the first law of thermodynamics: the law of conservation of energy.

− A perpetual motion machine of the second kind is a machine which would completely convert thermal energy into mechanical work. The thermal energy would be equal to the work done. However, it would violate the more subtle second law of thermodynamics [3].

Although the concept of perpetual motion is entirely hypothetical and contradicts well known laws, it has not constituted a substantial obstacle in inventing new types of perpetual motion machines. First attempts were made in the thirteenth century. Particularly many of them were conducted in the sixteenth and seventeenth centuries.

At technical museums all over Europe exhibits of prototypes created by not only the engineers but also amateurs can be found. It demonstrates the continuous interest in this idea and incessant desire of creation the miraculous machine. The figures below show examples of such exhibits from the collections of Vienna Technical Museum.

Fig.1. David Jones, Newcastle
University (England) 1999

Fig.2. Reproduction: Fa. Hüttinger (Germany)
1999 - Original: National Museum (Prague)

3. Bessler's Wheel

Trying to become acquainted with the perpetual motion machine concept, special attention shall be paid to an engine powered by the force of gravity and inertia of moving masses. The best-known conception of such a machine is Bessler's Wheel. In 1712, Johann Ernst Elias Bessler (alias Orffyreus) announced that he had constructed a 'self-moving wheel'. In the years to come, he presented four such wheels. In 1717, his largest wheel was tested: it was locked in a room in the castle to prevent any interference and set into motion. Eventually, it came to light that the constructor cheated to prove correct functioning of his invention..

4. The free-piston engine

The free-piston engine in accordance with the patent from 80's of twentieth century [1], which became a subject of the scientific group research, is one of many solutions of gravity engines. The analogy between it and Bessler's Wheel can be noticed. As regards to the idea of perpetual motion machine, it may be stated that the author focuses on the most effective use of energy from inertly turning masses and pressure of the medium being in a closed circulation. Compensation for loss of pressure and extortion that throws the engine out of balance, which are crucial for starting the engine, should come from outside. The main

advantage of the discussed solution is relatively small interference needed for set the engine into motion and its continuous action. It shows the contemporary inventors' approach to the subject of miraculous machines: looking for new solutions, using the analogy to the already existing ones and the available scientific knowledge, they strive to construct the most efficient device, which would allow easy acquisition of energy.

The main component of the engine is a drum (Figure 3.) which is situated on a shaft with rolling bearings. The pistons are positioned axially on the circumference of the drum and they lean against the outer ring. The drum is divided into two zones in which the pistons get respectively high and low pressure. The system which controls the pressure is located in the center of the drum. Hydraulic or pneumatic medium is in a closed circuit and it is pumped into cylinders. It causes that the pistons eject in the high pressure zone, which in turn places the ring eccentrically to the axis of the drum.

The belt stretched on the ring throws the mechanism out of equilibrium. The position of the mechanism presented in Figure 3. is necessary because action of the engine is based on the use of the gravitational force. The engine has many constructional variants. For example, the author points that pistons can be replaced with system consisting of bands and springs.

The idea of the mechanism is based on a change of the ring's instantaneous center of rotation. Two forces are generated with the belt stretched on the ring and they throws the mechanism out of equilibrium. These forces generate two unequal torques. Inequality of torque values is caused by inequality of the lever-arms vector lengths. Non-zero resultant torque causes rotation of the ring [4].
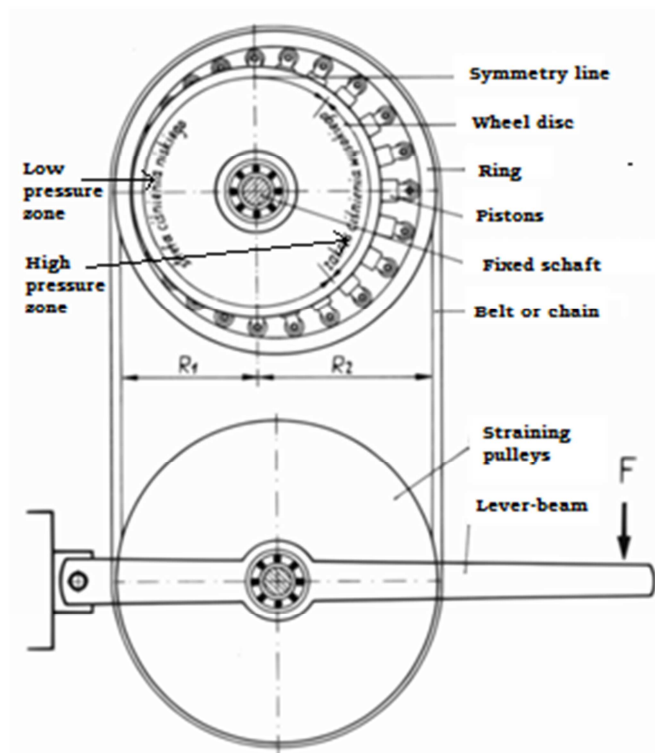

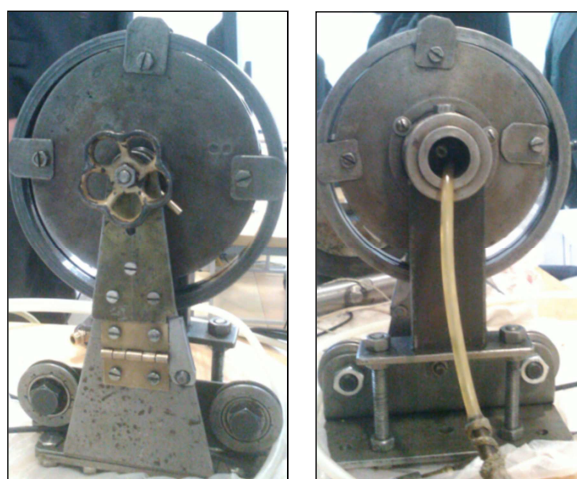*Fig. 3. The engine construction (according to [1])*

Fig.4. Author's prototype

Many analogies in terms of construction and operating principles of the engine were noticed in hydraulic pumps, in particular in a multipiston radial pump (Figure 5.). This assumption significantly facilitated creating 3D models of the engine and simulations of its work.
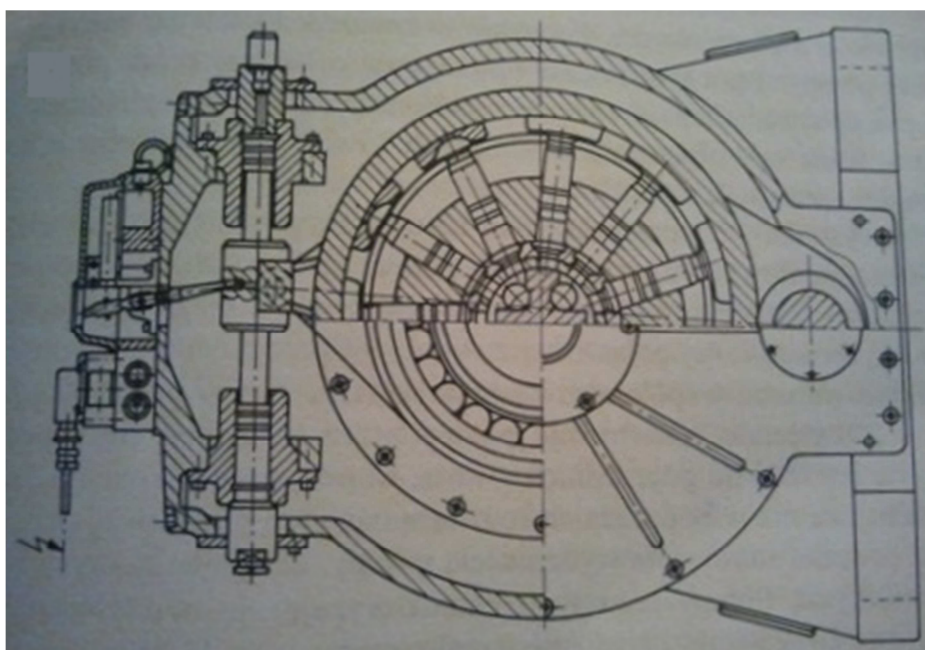

Fig.5. A multipiston radial pump - construction

In a multipiston radial pump, rotary motion of a ring causes reciprocating movement of pistons. As a consequence, hydraulic medium is sucked and then compressed. A distributive shaft functions as a valve. In the free-piston engine, rotational movement of the ring is caused by means of steering pistons pressure and applying force to the ring. Energy of ring revolutions as input and medium pressure as output in the case of multipiston radial pump is sequentially output and input in the case of the discussed engine [5].
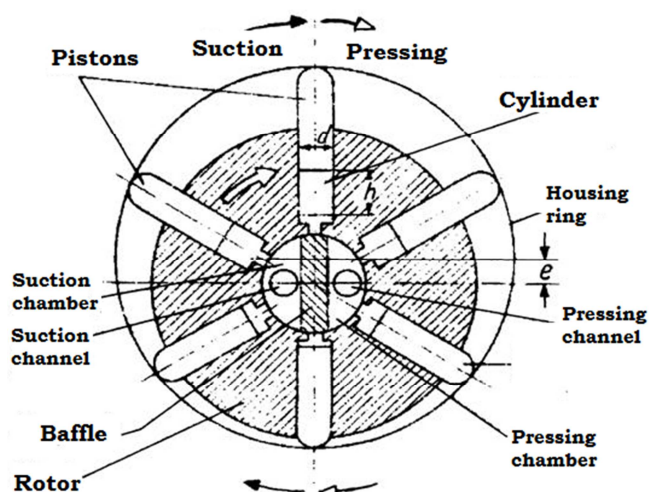
Fig.6. Principle of operation

5. **3D models of the engine and motion simulations in NX 7.5 software**

Within the framework of the scientific research group, simplified and detailed 3D models of the engine were prepared with the use of Modelling and Assembly modules of NX 7.5 program. Online catalogs such as: SKF and Festo were used for the purposes of preparing the detailed model.
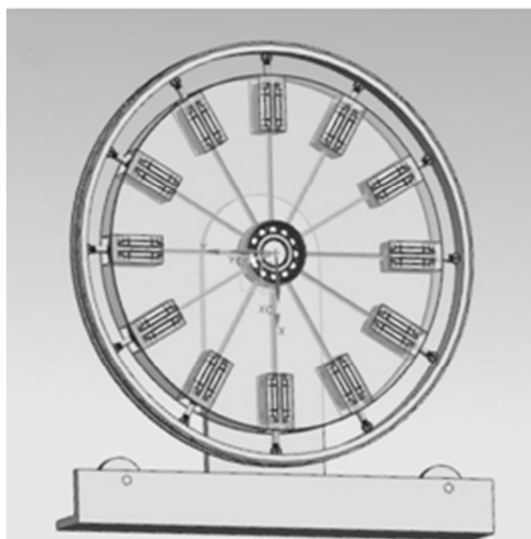

Fig.7. The detailed 3D model

The simplified model was used for carried out a simulation of pistons movement in Motion Simulation module. What is more, a function was calculated for this purpose with the numerical analysis (polynomial interpolation called also Lagrange's interpolation). This function allowed to steer movement of pistons.

In the next stage of the research analogy between the engine and a radial pump was used. Another simulation was obtained. In the simulation, conditions closer to the real ones during engine action were took into account by means of reversing pump principle of operation. It was not necessary to force pistons to move in the simulation with the previous function. Spring, one of the movement relation available in Motion Simulation module, was used for this purpose [5]. Hereby, the conduct of medium was simulated with some approximation.
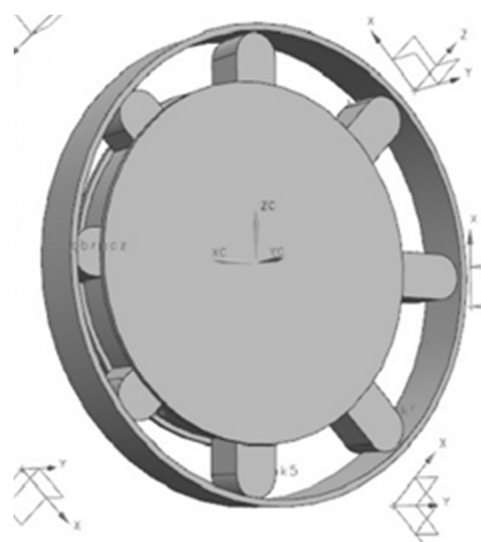

Fig.8. The simplified 3D model

6. **Conclusion**

The concept of a machine which work continuously without any interference when we can shortly experience the exhaustion of natural resources is something what would help to avert energy crisis and optimize production process. Increasing productivity, lowering costs and reducing a negative influence on natural environment are the current problems of great importance.

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