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Research on the Conversion of Universal Gravitation into Continuous Mechanical Energy

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Abstract: *This study explores the possibility of converting gravitational force into sustained mechanical energy. A mechanical energy conversion model based on water pressure is designed, which involves the interaction between sealed adiabatic compression, a thermal expansion body, and a gravity block. The sealed adiabatic compression, caused by increasing liquid pressure with depth under the influence of gravity, is used as the driving force to dynamically alter the internal gas temperature. Subsequently, the force arm torque of the gravity block is dynamically adjusted through the action of the thermal expansion body, generating a consistent torque that enables the system to continuously rotate and output mechanical energy. The calculation results show that the system can achieve sustained rotation, verifying the feasibility of using gravitational force to achieve continuous mechanical energy conversion.*

Keywords: *universal gravitation; Continuous mechanical energy; Sealed adiabatic compression and thermal expansion*

1. Introduction

Universal gravitation is one of the fundamental forces in nature, governing the motion of celestial bodies and objects on Earth. Despite its extensive influence, research on converting universal gravitation into sustained mechanical energy remains limited. This study aims to investigate the generation of sustained mechanical energy output through the rational design of a system that harnesses the effects of universal gravitation. To achieve this, a mechanical device was designed based on the interaction between adiabatic compression, thermal expansion bodies, and gravity blocks. The device analyzes the relationship between gas temperature and gravity block displacement, as well as the impact of force arm variations on system torque. Through theoretical analysis and simulation calculations, we explored the feasibility of converting universal gravitation into continuous mechanical energy.

2. Theoretical Basis

2.1 Basic Principles of Universal Gravitation

Universal gravitation, one of the fundamental forces in nature, was proposed by Newton. According to the law of universal gravitation, the attractive force between two massive objects is proportional to the product of their masses and inversely proportional to the square of their distance. This force not only governs the motion of planets and stars but also affects objects on the Earth's surface; for instance, the weight of an object is a direct manifestation of Earth's gravity. Although Einstein's theory of relativity has uncovered the relationship between gravity and the curvature of space-time, Newton's law of gravity remains the foundation for calculating gravitational effects in mechanical systems, particularly in exploring the conversion of universal gravitation into sustained mechanical energy.

2.2 The Relationship between Dynamics and the Action of Force Arms

Dynamics examines the relationship between an object's motion and the forces acting upon it, where the product of force and the force arm produces torque, determining the object's rotational state. The force arm is the perpendicular distance between the applied force direction and the axis of rotation. The longer the force arm, the greater the torque it generates. In systems with asymmetric force arms, the longer arm produces greater torque, inducing rotation. In mechanical energy conversion, rational

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system design can create optimal dynamic changes in force arms, ensuring consistent rotational torque and achieving continuous mechanical energy output.

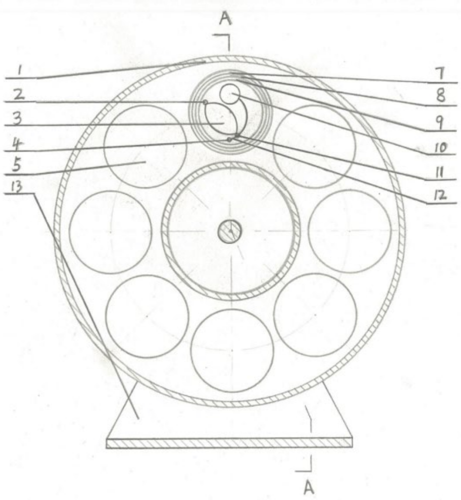
2.3 Energy Changes during Adiabatic Compression and Expansion Processes

The adiabatic compression and expansion process, which involves no heat exchange, is a critical concept in gas dynamics. During adiabatic compression, the gas volume decreases while its temperature and pressure rise; conversely, during adiabatic expansion, the gas volume increases as its temperature and pressure drop. By leveraging the volume change of the expansion body, the energy within the gas can be converted into mechanical energy to drive the movement of the gravity block. By synchronizing regular changes in gas pressure and temperature, continuous mechanical energy conversion can be achieved[1].

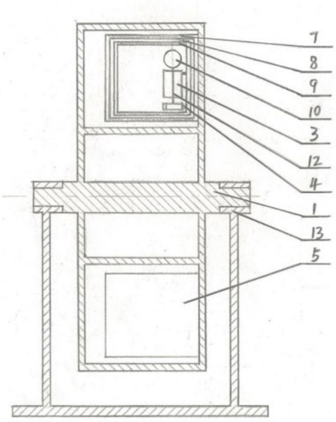
3. Mechanical energy conversion model based on universal gravitation

3.1 Model Design

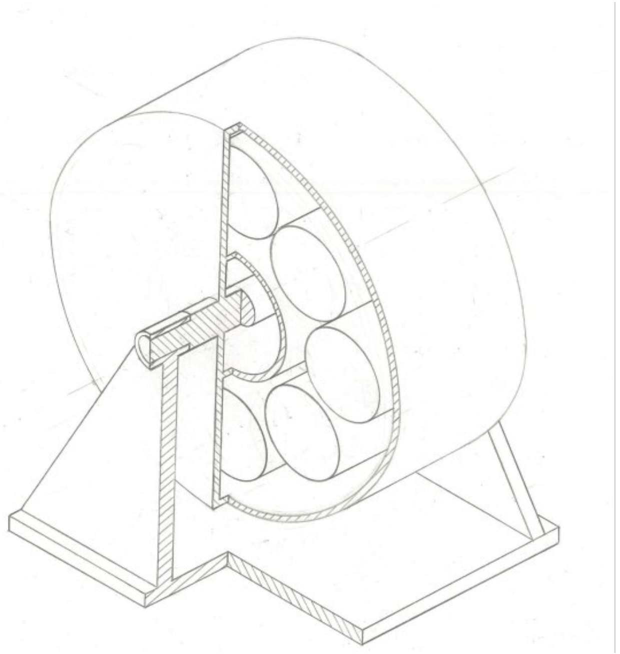
This study designs a device that converts universal gravitation into mechanical energy, with the detailed structure shown in Figure 1.



(a) Internal structure of the device



(b) Overall side structure of the device



(c) Device body

① Rotary water tank ② locating pin ③ thermal expansion body ④ locating pin ⑤ compressible sealed insulation box ⑦ is an outer sealed insulation box ⑧ vacuum insulation layer ⑨ inner sealed insulation box ⑩ gravity block ⑪ pin ⑫ bracket ⑬ support

Figure 1: Mechanical energy conversion device based on universal gravitation

In the above structure, the rotary water tank ① is supported on the bearing seat on the support ⑬ and can rotate freely. Several compressible sealed insulation boxes ⑤ are evenly distributed and fixed inside the rotary water tank ①, and the internal structure of each insulation box is completely the same. The compressible sealed insulation box can be compressed along its axis direction, consisting of an outer compressible sealed insulation box ⑦, an inner compressible sealed insulation box ⑨, and a middle vacuum insulation layer ⑧. The fixed end of the sealed insulation box is equipped with a gravity block ⑩ fixed to one end of the bracket ⑫, and the other end is fixed to the fixed end with a positioning pin ④. The gravity block ⑩ can swing around the pin ④, and the swing direction is the tangential direction of the rotating water tank where it is located. One end of the thermal expansion body ③ is hinged to the bracket ⑫ with a pin ⑪, and the other end is fixed to the fixed end with a positioning pin 2. After assembly, this device needs to undergo dynamic and static balancing.

3.2 Working Principle

The working principle of the model is as follows: First, the rotary water tank is filled with water, and the compressible sealed insulation boxes are filled with atmospheric gas at normal temperature. Once the water tank is filled, the free ends of each sealed insulation box are subjected to water pressure, compressing the internal gas. Due to the height difference between the upper and lower parts of the tank, the free end of the upper sealed insulation box experiences lower pressure, resulting in less gas compression, while the free end of the lower sealed insulation box experiences higher pressure, leading to greater gas compression. Since the compression occurs under sealed insulation, the adiabatic pressure formula indicates that the gas temperature in the lower part is higher than that in the upper part.

$$\left(\frac{T2}{T1}\right)=\left(\frac{P2}{P1}\right)^{\frac{\gamma-1}{\gamma}}$$

To achieve a sufficient temperature difference, the diameter of the water tank can be increased. The gas inside the sealed insulation boxes will experience compression at all angles, creating a condition where there is a constant temperature difference between the upper and lower parts of the tank. The thermal expansion body within the sealed insulation box expands in response to the increased gas

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temperature, pushing the bracket (⑫) to rotate and causing the gravity block to shift. Due to the temperature difference between the upper and lower parts, the displacement of the lower gravity block is greater than that of the upper gravity block. This results in asymmetric force arm changes between the left and right gravity blocks, generating unbalanced torque that drives the rotation of the water tank. The unbalanced torque persists in a constant direction at all angles, enabling the water tank to rotate continuously. As the sealed insulation box rotates from the highest to the lowest point, the gas inside is gradually compressed, raising its temperature. The thermal expansion body progressively expands, and the gravity block's displacement increases. When the box reaches the lowest point, the displacement of the gravity block is at its maximum. As the box rotates from the lowest to the highest point, the internal gas gradually expands, its temperature decreases, the thermal expansion body contracts, and the gravity block's displacement reduces. When the box returns to the highest point, the displacement reaches its minimum, completing one rotation cycle. Throughout the rotation process, the model maintains dynamic equilibrium, consistently generating power and externally outputting mechanical energy[2-3].

3.3 Simulation calculation of the model

As shown in Figure 2, assuming that the center water depth of the compressible sealed insulation box labeled ① is 2.5 meters and the temperature of the internal gas is 10 °C, organic glass is used as the expansion body, with an expansion coefficient of 130 × 0.000001/°C. The ratio of the linear expansion of the expansion body to the displacement of the gravity block is 1:10. Under the ideal condition of no heat conduction inside or outside the sealed insulation box, the simulation calculation results are presented in the following table using the formula $\left(\frac{T2}{T1}\right)=\left(\frac{P2}{P1}\right)^{\frac{\gamma-1}{\gamma}}$ .The simulation results are shown in Table 1.

Table 1: Simulation Calculation Results

Insulation box serial number	Depth/mm	Pressure/kg	Gas temperature/°C	Gravity block displacement/mm	Left arm/mm	Right arm/mm
1	2500	0.25	10	0	6200	64500
8	4500	0.45	61.8	236	6200	64500
7	9500	0.95	141.6	599	8900	8900
6	14500	1.45	195	842	6900	5800
5	16500	1.65	212.6	922	8900	5800
amount to					22900	21150

From the calculation results, it is evident that as the water depth increases, the temperature of the gas inside the sealed insulation box rises alongside the displacement of the gravity block and the force arm. Due to the unequal displacement of the upper and lower gravity blocks, the sum of the force arms on the left and right sides becomes imbalanced, resulting in unbalanced torque that drives the gravity block and rotates the model counterclockwise. This result provides theoretical data support for the conversion of universal gravitation into continuous mechanical energy. The power generation is attributed to the pressure difference between the high and low positions in the water, which causes a temperature difference in the gas within the sealed insulation box. This temperature difference, in turn, leads to unbalanced torque caused by the differing expansion levels of the upper and lower expansion bodies. Additionally, since there is a constant pressure difference between the high and low water positions, this power remains consistent. The model generates unbalanced torque in the same rotational direction at any angle, enabling continuous rotational power, sustained energy conversion, and the external output of mechanical energy[4].

3.4 Force Analysis

From the perspective of factors determining power generation, two critical factors are identified:

(1)The insulation performance of the compressible sealed insulation box and the performance of the thermal expansion body. The insulation performance of the compressible sealed insulation box determines whether the mechanism can effectively generate power. While achieving 100% insulation is impossible, multi-layer vacuum insulation can be used to minimize heat exchange and conduction as much as possible[5].

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(2)The performance of thermal expansion bodies, which can be optimized by using materials with high thermal expansion coefficients and low specific heat capacities, such as organic glass. This ensures better conversion of thermal energy into mechanical energy. Additionally, a distance-increasing mechanism can be employed to achieve greater displacement of the gravity block.

From the perspective of power and resistance analysis:
(1)Power Analysis: If there is no temperature difference between the upper and lower parts, the expansion of each thermal expansion body is uniform, the displacement of each gravity block is identical, the sum of the left and right force arms is equal, and the torque cancels out, resulting in no rotational power. When a temperature difference exists between the upper and lower parts, the displacement of the lower gravity block exceeds that of the upper gravity block. Consequently, the sum of the left and right force arms becomes unequal, creating unbalanced torque that generates rotational power[6].

(2)Resistance Analysis: The resistance mainly includes two types:

The first type is the rolling resistance generated by the rotary bearing, which is relatively small. Second, the resistance caused by heat conduction. If, during the rotation of the rotary water tank, there is no heat conduction inside or outside the sealed insulation box in an ideal state, and the heat inside each sealed insulation box remains uniform, the rotary water tank stays in equilibrium at any position and angle (excluding the effect of gravity blocks), and no reverse resistance occurs. However, if heat conduction occurs, the internal heat distribution within each sealed insulation box becomes uneven, causing the rotary water tank to enter an unbalanced state and generate reverse resistance.

From the combined perspective of power and resistance: Assuming no heat conduction, the primary resistance is the rolling resistance of the bearing, which is controllable and can be overcome by the power generated by the gravity block. Therefore, the mechanism can produce power and rotate. However, if heat conduction introduces resistance, power loss occurs. If the power loss is small, the mechanism can still output power. If the power loss equals the power output, the mechanism's power becomes zero, and the model ceases to rotate. The greater the heat conduction, the higher the power loss, eventually reducing the output to zero. This analysis highlights that the key factor determining whether the model can generate power lies in the technological and manufacturing capabilities to prevent heat conduction and minimize heat loss. The challenge is not theoretical but practical[7].

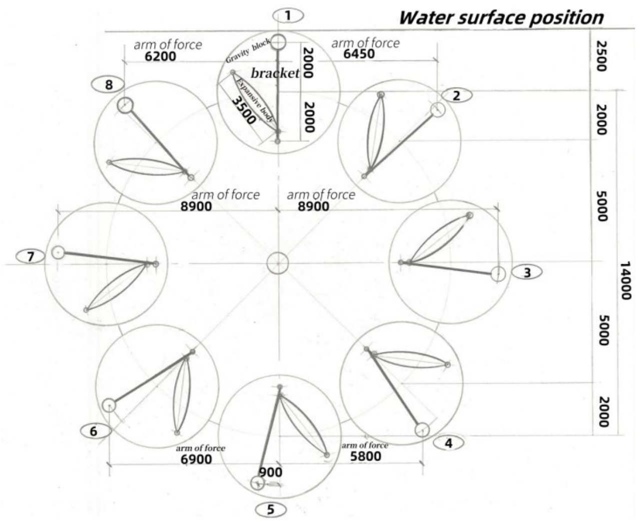

Figure 2: Force arm situation during device operation

4. Conclusion

In conclusion, this study confirms the feasibility of achieving sustained mechanical energy output under the influence of universal gravity. The calculation results demonstrate that a well-designed force arm system, combined with the dynamic interaction of gravity blocks, enables the system to operate continuously through the combined effects of compressed gas and universal gravity. The expansion and compression processes of gas effectively enhance the differences in force arms, creating sustained torque variations that allow the system to stably output mechanical energy. This study offers a

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theoretical foundation and data support for the further development of mechanical energy conversion devices utilizing universal gravitation. It also introduces a novel approach to converting universal gravitation into sustained mechanical energy.

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