

Application of Aerodynamic Fountain Technology in Fitness Equipment

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Abstract. Faced with people's increasing emphasis on fitness activities and the increasing demand for fitness diversification, the paper has designed a small footprint, low price, full-featured functionality, which can be widely used to meet various needs. Various indoor fitness equipment is required for fitness. Through the use of a reasonable structure, several fitness methods of indoor fitness will be integrated into one product to realize the concept of an efficient exercise and create a thrifty, environmentally friendly and harmonious social environment.

1. Introduction

When people's material lives are improved, they face the grim reality of traffic jams, energy crisis, and panic fears, sports, health. Happiness is gradually forming our spiritual philosophy of pursuing happiness. Fitness-powered musical fountains do not only advocate sports, health, but also happy life. Indoor exercise equipment is an integral part of the sports industry. It has a strong momentum of development in current society. Education advocates tapping human potential, science. Technology are exploiting natural resources, limiting natural resources, and human potential. Wisdom and loyalty are the promises of human civilization.

2. Determination of the Project

When sports, health, and happiness have become the concepts pursued by modern people, we have found that many people are slowly adding fitness equipment to their homes. This is an occasional act for those families with better economic conditions to go out and drive home. For most ordinary families, walking after dinner or joining square dance are the best options. The recently-developed team of Plaza Fitness is not only the leading popular star, but also the need to regulate the group. It is often difficult for government leaders to pay for management and follow-up expenses. People also have awkward situation of cost accounting. The initial conception of this fitness-powered music fountain was born under this background.

3. Production Plan

Occasionally, it was discovered that the children had been drinking soft-packed drinks and they were spurted by pedestrians. Based on this, we chose a bottle of mineral gas. When the gas is not covered, we can use our hands to press the gas. Although the gas can be pressed out but the gas potential is very weak, we cover the lid and drill a small hole in the lid and find that the hole diameter is the same under the same pressure. The higher the gas jet in the vial, but as the gas level in the bottle decreases,



the gas jet situation changes significantly. Because the upper part has air, it is also obvious that the gas cannot be sprayed. So we insert a plastic tube through the hole. If the tube can penetrate the bottom, the gas spray will continue until the gas in the bottle is sprayed.

3.1. Product Design Analysis

Product function and environment analysis mainly study the design method of the indoor multi-functional fitness equipment. While the versatility and rationality of the indoor fitness equipment is mainly realized in different spaces and different ways of exercise. In order to meet the needs of various fitness functions of student groups and adapt to the spatial characteristics of the dormitory, a variety of exercise methods that this indoor fitness equipment should possess are summarized. It mainly includes sit-ups, push-ups, tension, and grip strength. There are several ways to exercise dumbbells. This product is mainly used in student dormitories, staff quarters and some relatively small spaces. As this product is a versatile, lightweight, portable product, its use of environmental space is relatively diversified. There is a relatively large range of use environments.

3.2. Product Positioning Analysis

Currently, small multi-functional fitness equipment on the market is rare. This product is mainly targeted at low-end market, positioning the price is relatively low to meet the purchasing needs of various groups of people, especially students. The product can meet the fitness needs of students and residents, but also fill the market gap of small multi-functional fitness equipment.

4. Production

According to the scheme we explored, we first created a schematic diagram of the structure by the author. The schematic diagram uses two compressed airbags that inflate the balloons. These two airbags are connected to a storage tank. A fitness exercise platform is established on the airbag. When the person moves on the platform, pressure is applied to the platform. This pressure compresses the airbag and forms a jet of gas. We designed a lid on the tank that can be sealed with a rubber sleeve and a rubber gasket. At least two holes open in the lid. One nozzle is installed to spray the gas upward, and the other is installed for the downstream gas. Then we valve, and bond or weld the gas tank on the edge of the lid. Compressed airbags are connected to gas storage tanks, and the gas tanks are fastened to the gas tanks. We fix these parts in a special wooden box to form a show to participate in the city's innovative event display.

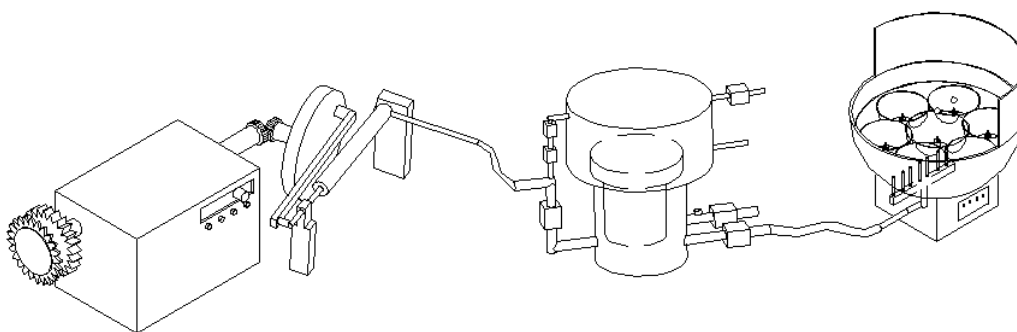


Fig 1. Works showed in creative activities

5. Project Design

An aerodynamic fountain applied to fitness equipment includes a gearbox, a pneumatic pump, a gas storage system and an air fountain.

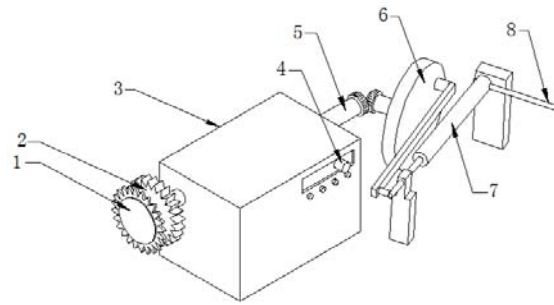


Fig 2. Aerodynamic fountain structure (part a)

1) -Chain gears.

It can be linked to fitness equipment with a chain, transferring the work done by fitness equipment to the gearbox.

2) – Gears.

It can be connected to fitness equipment with timing belts or gears to transfer the work done by the fitness equipment to the gearbox.

3) -Transmission body.

4) - Speed control switch, 4 speed adjustment.

5) -Output shaft.

The design of the gearbox allows the present invention to be applied to different fitness equipment, either as a chain or as a gear or timing belt. At the same time, it can be connected with a variety of speeds of fitness equipment, but also to ensure that the output speed is within a controllable range. It will not cause damage to the air pump.

6) -Crank rocker.

7) - Pneumatic pump.

There can be more than one pneumatic pump. In this picture, it has one.

8) - First exhaust pipe.

It is used to connect the next structure, which serves as the gas storage system.

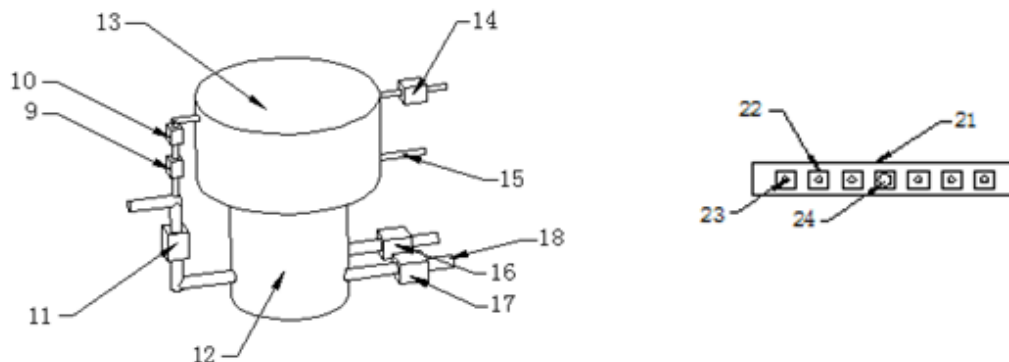


Fig 3. Aerodynamic fountain structure (part b)

9) - Pressure reducing valve, which is used to maintain the pressure difference before and after the pressure reducing valve. It is about 0.4 Mpa before decompression, 0.2 Mpa after decompression.

10) - The first check valve controls the flow of gas in one direction, and this pipe is fine and the gas flow is small.

11) -Second check valve,

12) - Store cylinders and store gas are used to maintain relatively stable pressure for a short time.

13)-Balanced cylinders can make the storage cylinder under the rated work. The pressure does not change, the volume expands, and the gas storage capacity increases.

14) 19-T piston rod.

Its upper and lower area ratio is 2:1. It can produce a pressure of 1:2 up and down.

15) - The first relief valve.

When the pressure in the balance cylinder exceeds the rated working pressure, the gas flows out. It is used to prevent air pressure from being too high.

16) - Balance tube Always balanced

The atmospheric pressure is below the T-piston rod in the cylinder.

17) - The second relief valve prevents overpressure.

18) - The third check valve allows one-way flow of gas.

19) - Second exhaust pipe connects to the next structure - air fountain.

20) -Barometer. Real-time air pressure is detected and transmitted to the control system.

21) -Distribution pipeline.

22) - Electromagnetic check valve. The check valve can be controlled by the control system.

23) -Divided bronchus.

It is used for connecting branch nozzle.

24) -Main trachea.

It is used to connect the main gas nozzle.

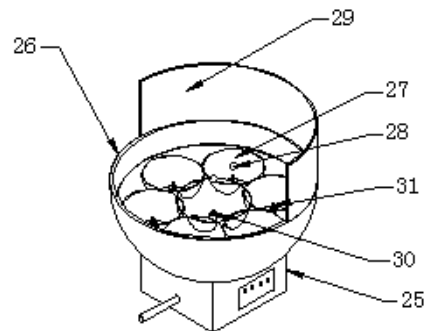


Fig 4. Aerodynamic fountain structure (part c)

25)- Fountain base.

26)- Fountain shell.

27)-Balloons.

Each lightweight hollow ball has its own single semicircular ball socket. To prevent the ball from falling to another place, the ball will come into contact with the gas nozzle at the bottom, so that it can fly again.

28)-Light Hollow Ball.

29)-Transparent glass covers to prevent the impact of other air currents to prevent the ball from running.

30) -The main gas nozzle converges into a smaller gas outlet above the gas nozzle to facilitate air concentration.

31)-Branch nozzle.

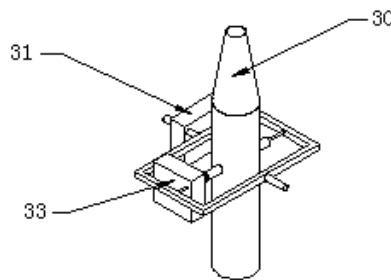


Fig 5. Aerodynamic fountain structure (part d)

$$y_{i,t} = \alpha + \beta x_{i,t} + \mu_{i,t} \quad (1)$$

In which, i and t represent cross-sectional data and time series data (in the text, $i=1, 2, 3, 4$, $t=2010, 2011, 2014$, and β is a regression coefficient vector.

This paper uses the power level (forced spray rate) as the dependent variable, and builds the data model based on the factors of the industry level, macro factors. The level of the equipment itself is independent variables. $ROA_{i,t} = \alpha + \beta Z_{i,t} + \gamma \beta_{i,t-1} + \epsilon_{i,t}$.

32) - First steering gear.

33) - Second steering gear.

Under the control of the control system, the main gas nozzles are controlled to move in different dimensions. The main nozzle moves in the same way as the branch nozzle.

The control system, which is not shown in the figure, detects the air pressure--reaches the rated working over-pressure. The switch of the electromagnetic one-way valve can be controlled separately, and the two servos of the fountain can also be separately controlled. The air nozzle can be moved regularly or irregularly.

In this way, as long as the athletes carry out equipment fitness exercises, lightweight hollow balls can perform various modeling exercises according to the set procedures. It is also possible to add a generator behind the crank rocker. The entire system uses less electricity, which can be operated with a small generator.

Work form and status:

For example, if the exerciser has low exercise intensity, the storage cylinder can only work in half. The main air spout in the fountain works, which is suitable for various fitness equipment and different groups of people.

While using, we increase the fun of exercise. In order not to let the ball fall, you need to continue to exercise, increase the interest of the training and the enthusiasm of the exercise. It is also possible for two or more devices to jointly connect a gearbox or a storage cylinder. More people jointly push an air fountain.

The exact amount of work done by the trainer is calculated based on the barometer value, the exhaust pipe cross-sectional area, and the work time.

6. Experimental Verification

The fitness-dynamic musical fountain we design and manufacture, and the structure participating in the activities of county and city exhibitions are works formed by plastic components and viscose connections. In the display process, we discovered that the gas spray effect was obvious but not sustainable. Later, the nozzle was connected after connecting the one-way valve. The one-way valve allows the gas tank to maintain a relatively stable pressure, so that the gas spray effect is obvious. Although the initial connection of plastic components can demonstrate the principles of design and express the fitness-powered music fountain function, the stability and solidity of the structure, as well as the coordination after the combination of the components, as well as the feelings during the human operation process all exist. Some areas for improvement still exist too.

This type of school-enterprise integration does not only expand new horizons, but also find possible research collaboration for finding problems, solving problems, and technical difficulties in formulating programs. Our participation in the county and city youth science and technology innovation display works is a combination of plastic components, adopting viscose connection and fixation. This approach can only express our ideas in principle, but there are still some defects in the practicality we will improve. The use of metal components to compress the airbag has to use a piston device. The metal material for the gas storage tank can be improved by using old fire extinguisher cans, in which trilling and welding can be used. The spray head in the gas tank can be easily purchased, and the metal check valve can be used. The screw is fixed on the gas storage tank, the gas tank can be welded on the lid of the gas storage tank, and then the rubber gasket is used to solve the air tightness, which is also widely used in the traditional electric powered fountain.

7. Summary

Fitness-powered musical fountains are technical products that our scientific and technological innovation teams can design and build in institutions, schools, communities, and families. The application of human power is a wonderful idea, and the circulation of gas resources is more of a peculiar bright spot. This design does not only promote the concept of life in sports, health, and happiness, but also focus on the ecological civilization that is harmonious and co-prosperous with people and nature.

Acknowledgments

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