

Analysis about energy-efficient umbrella machine to make the wet umbrella dry

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Abstract. People will always carry wet umbrella to shop, libraries, and other indoor places. These phenomenon always contribute to wet and slippery ground and a series of complex cleaning work which indirectly reduce customers' purchasing power. Based on this kind of phenomenon, we explore to design a magic umbrella machine which is energy-efficient and enable make it convenience for people in public to reach the aim of drying umbrella fleetly.

1. Analysis of current situation about wet umbrella

1.1 Traditional solution to the placement of wet umbrella and its existing problems

(1) At present, it is generally to open up the wet umbrella and dry it naturally, which cost at least 2 hours. In the room, lacking of a balcony, the open umbrella is an obstacle to walk, and the ground needs to be cleaned up.

(2) In some public places, such as supermarkets and restaurants , the wet umbrella carried by customers will be put into plastic bags by the waiter. However, it is not only cost labor resources, but bring new garbage like the white pollution. It is not conducive to environmental protection.

(3) In some places, in order to ensure a comfortable indoor environment, buckets are placed at the entrance. But there will be some embarrassing things like taking the wrong umbrella accidently. If the situation is serious, these embarrassing things will turn to be unnecessary conflicts.

1.2 The current situation of similar functionality umbrella device in domestic research.

According to the survey that there were the umbrella with the dry system, and has applied for patent. This kind of umbrella is equipped with switch button in its umbrella handle. And the battery installed in the tail of the umbrella which is convenient for the replacement of battery installation. There is the power line which is connected with the bottom battery and switch button inside the umbrella. Umbrella is capped with a small motor, the transmission part of the small motor connected to the bracket of umbrella, with the help of electric power, the water on the surface of the umbrella bracket could be dried.

The advantage of such devices, which dried the umbrella itself, is that they get rain dry system and the umbrella together, and that is a great convenience for individual users. But its shortcomings are obviously, the cost of umbrella is relatively high so that it is not suitable for universal use.

2. The theoretical base of the solution

According to the survey and research on current situation above, my essay put the emphasis on the machine which can make the umbrella dry quickly and can be used in public place that can contain many persons. This machine can make several umbrellas dry in short time (just 1 minute),and meet the environment's require in cost as low as possible .I try to make the solution best .There are the demand of the design:

(1)The system which can make umbrella dry is a kind of installation can be used to some extent. It is suitable to various umbrella ,and can be used widely.

(2)The installation should change the size and capacity on the basis of different places' scale and the quantity of people ,to make the umbrella dry quickly and in time.

(3) In order to cut down the cost and simply the structure and layout, it should adopt the way of purely mechanical drive equipment. Therefore it can be accepted in price .

3. The specific content of the design scheme

3.1 There are two steps to make an umbrella dry:

(1) Take the advantage of centrifugal force to dry the umbrella, similar to the principle of clothes drying machine.

(2) Drying the umbrella with hot air for the second time in order to achieve design requirements.

3.2 The dryer mainly consists of four systems:

The drying system: As shown in the figure 1, design the gear transmission device .The gear is inversely proportional to the radius and speed, assembling a transmission system that can be driven by a mechanical rotating device. The device for pedal can achieve a higher speed 150 RPM.

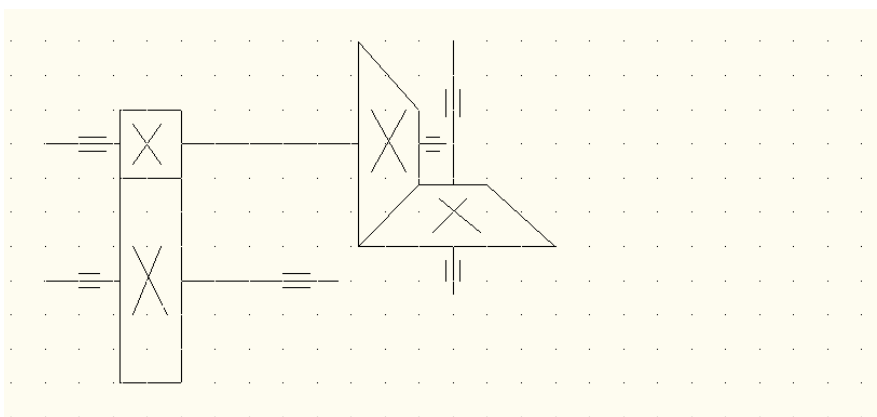


Fig. 1 The gear transmission device

The umbrella holder system: There is a plurality of holes on the edge portion of the dry device inside an inverted cylindrical, which can be inserted more umbrellas. The key problem in this system is the reasonable arrangement of whole number and arrangement mode in order to achieve the best efficiency of drying and clamp umbrella without damage. Through many experiments, we finally designed a clamping system, suspending 4 umbrellas.

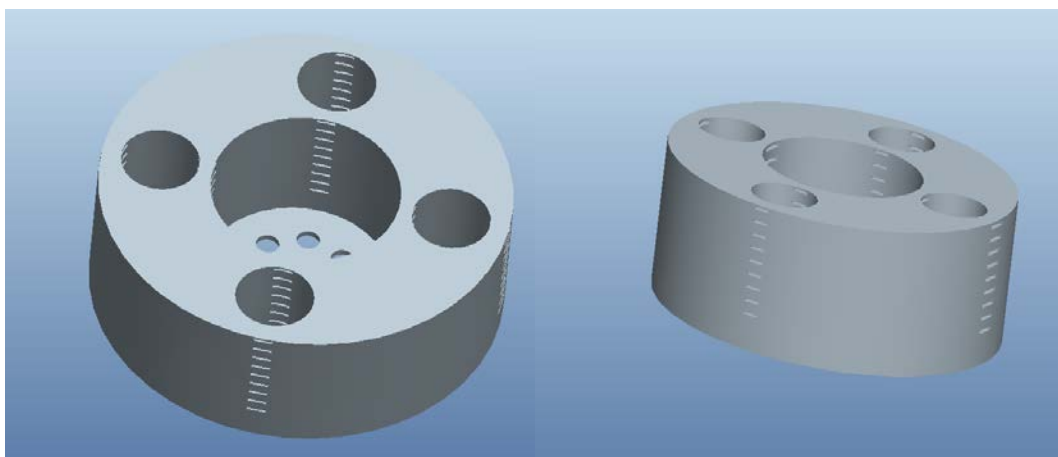


Fig. 2 The umbrella holder system

The rainwater collection system: It is connected with the drying device. There is a water bucket below the device. The rain drips into the rainwater collection device through holes, while the rain that is thrown out dribbles down to small grooves by the tilt of the waterproof wall and finally into the rainwater collection device

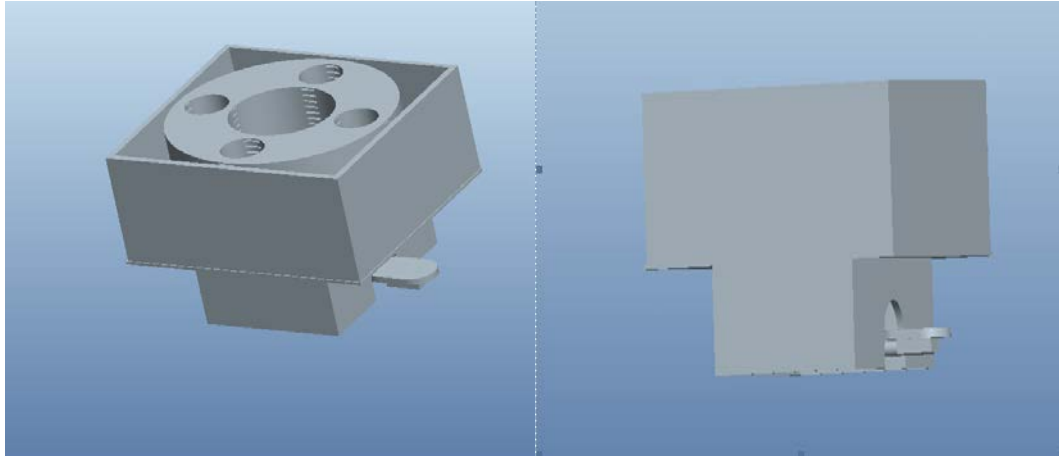


Fig. 3 The whole device three-dimensional figure

The hot air drying system :After drying, bring the hot air to the device .The mouth of it doesn't conflict with the outlet and the hot air can be as much as possible contacted with the surface of the umbrella in order to reach the drying effect.

4. Improvement design:

This design is an innovative one. It is still in its infancy with some complexities of design and difficulties of operation, but there is much room for improvement in different ways.

4.1 Difficulties of operation and the new problems of object-making

The materials of umbrella is different from those of clothes, for there is more metal support materials on the umbrella stand. If the umbrella is put in a wrong way, it is probable that the inner structure of it will be damaged, thus decreasing the life of it greatly.

Where the visitors flow rate is great, for example, in the doorway of supermarkets or shopping center, there must be a need for fast drying. However, considering the size of the umbrella-drier and its space taking, it is quite difficult to dry many umbrellas at the same time.

The mass of the umbrella-drier is great, which makes it difficult to fix the rotating system securely enough, so it sways when running.

4.2 The new solution to some facing -problem

We can tie resistance wire around the umbrella clamping system, therefore we can make use of the heat of the resistance wire to evaporate part of residual moisture. The temperature should play a part of evaporation and not damage the umbrella fabric, so the resistance value and the distance from the resistance to umbrella must cooperate with the actual size of the dryer.

Adding some things which water can be absorbed strongly around the inside of the umbrella system. At the same time, the water absorbent material release heat accompanied absorbing water. That is helpful to the dry of umbrella if the temperature is appropriate.

The box can be connected directly to the outlet of the underground passage. And it not only save space and material in the design of the water storage box, but also reduce the inconvenience to users of dumping waste water etc.

4.3 The umbrella dry device development trends

Determined by the development of high-tech industries of automation, the umbrella dryer must not exceptional also. In late dryer design mainly considers the structure of the automatic design and realization of automation. Core principle of the device type and pedal drive is the same, the difference is that their drive form, pedal type drive is driven by human foot pedal operating the device, automatic drive is to rely on the power switch control system after power drive device driver of the device. The device's main parts as follows:

(1) automatic drive operation need to design a power switch control system.the switch control system through microcontroller programming to control the start and stop of small power drive.

(2) Automatic device have a control panel, on the control panel to control start, stop, switch button, can also install a display, show time, speed, time and so on

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