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Original Article

Design and Research of Automatic Soap Remover Based on Miniature Optical Sensor

Xijie Hua[1], Shetong Jia[2], Shuai Yang[3], Hongbo Zhang[4]

[1]*School of Mechanical and Automotive Engineering, Shanghai University of Engineering Science.*
[2]*China, Shanghai, Songjiang, 201620.*

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Abstract *- There is a large demand for soap in China, but using soap is extremely inconvenient. This design uses the method of automatically cutting soap to solve the inconvenience of using soap in the past and achieving the integrated process from "induction - cutting soap - finishing - using" to avoid non-essential contact and waste. the device mainly solves the problem based on the above-mentioned public health issues caused by direct or indirect contact. It is uncomplicated for users to clean their hands. It reduces the chance of people having physical contact with the same soap in public places, but it is also more conducive to the maintenance of personal hygiene.*

Keyword *- Soap, Automation device, Solid material cutting, Health protection.*

I. INTRODUCTION

Pneumonia epidemic at the end of 2019, People all over the country actively participate in epidemic prevention and control work. At the same time, personal and public health protection issues are highlighted. To effectively strengthen protection, various prevention methods emerge in an endless stream. the use of soap is one of them. But how to use the soap is a considerable issue.

On the one hand, using soap in public places increases the probability of contact, which is easy to cause infection. on the other hand, it is necessary to solve the storage and waste of soap. in response to such situations, this design uses micro-optical sensors to realize automatic cutting of soap to effectively solve such problems, which greatly improves the efficiency of using soap in our daily life. When you need to use soap, you only need to put your hand on the soap shavings outlet at the bottom of the device. the sensor will automatically sense and issue instructions to automatically cut out the soap needed for one hand washing, preventing indirect contact caused by the use of soap from the root cause. At the same time, it is also efficient and handy for the storage and timely replacement of soap[1][2][17].

The invention relates to an automatic soap cutting device, which comprises a casing, a soap installation part, a cutting tool part, an electromechanical transmission part, a battery power supply part, a sensor part, a bottom hardware support part and a fixed structure part. the soap installation part, the battery power supply part, the motor driver in the electromechanical transmission part, and the bottom end hardware support and fixing structure are fixed on the device casing through the connecting piece. the above-mentioned automatic soap cutting device uses a cutting tool to cut the soap shavings from the soap, making it convenient for users to clean their hands. in addition, the automatic soap cutting device has a simple structure, easy maintenance and low cost. It is conducive to promoting the maintenance and application of public health.[7][8][20]

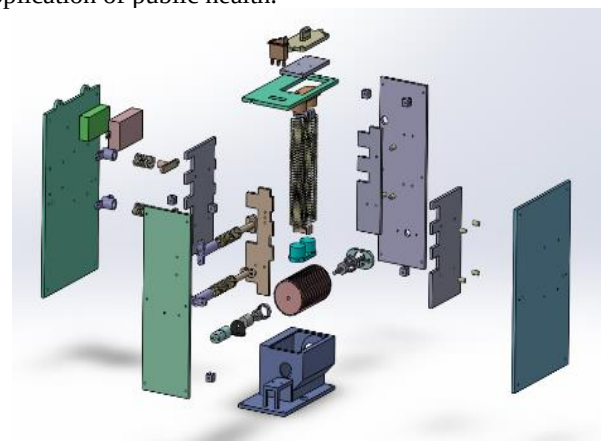

Fig. 1 Exploded view of the mechanical structure model of the soap cutting device

A. Feeding Transmission Mechanism

The main body of the transmission mechanism is a spring, which adopts the traditional physical transmission principle. When the soap is placed at the starting position, the spring is deformed by force. Under the action of the reaction force, the two springs on the top push the pressure plate to squeeze the soap to move downward. As the cutting process progresses, the volume of soap changes and the force of the spring changes accordingly. the two springs on the side mainly play a fixed role. When the size of the soap is too

large or too small, it is mainly responsible for pressing the soap to reduce vibration and prevent damage to the mechanism.[12][13][14][19]

B. Cutting Transmission Structure

The cutting transmission structure is that the motor drives the tool shaft to rotate under the action of the coupling, and the tool is fastened on the shaft by the fixing device. When the motor starts to drive the shaft to rotate, the tool will cut the soap[3][4][9].

C. Intelligent Control Structure

The intelligent control structure is mainly realized by the combined action of components such as infrared sensor, system board and driver board. When the sensor recognizes the user's usage instruction, it will transmit the signal to the system control board and then issue an instruction to automatically start the motor[5][10][11][15][22][21].

D. Main Innovations

- The structure is simple, the cost is low, it can be adapted to any soap of different sizes and shapes, and the cutting transmission mode is simplified and has strong stability.
- Change the traditional method of using soap. Meanwhile, it is more conducive to storage and running out of soap, which improves the utilisation rate.

II. CONCLUSION

This automatic cutting soap machine device is a further innovation of the traditional way of using soap and realizes the integrated process from "induction - cutting soap - soap shavings - using", which greatly improves the efficiency and convenience of using soap. More importantly, this device reduces soap waste and improves the cleanliness of the public environment. At the moment, when the epidemic still exists, the automatic cutting soap machine effectively avoids the indirect contact caused by using soap and has a strong practical significance in public places with large human flow[6][16][18][23].

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