A Design of a Piece of Equipment to Deactivate Enzymes in Foliage by Baking

Can Kou*

College of Applied Technology, Lijiang Teachers College, Lijiang, Yunnan, China

*Corresponding author e-mail: haoxue163@eiwhy.com

Abstract. The main purpose of deactivation of enzymes is to destruct and passivate the activity of oxidase in foliage through high temperature, so as to inhibit the enzymatic oxidation of tea polyphenols. By evaporating part of the water in leaves, fresh tea leaves will get soft, which is easy to be rolled into shapes. Meanwhile, it enables tea leaves to form high-quality aroma. This paper introduces a piece of equipment to deactivate enzymes in foliage with a flue gas disposing function, which benefits the users in reducing cost and improving efficiency. The practicability of the equipment is enhanced as well.

Keywords: Foliage, Equipment to Deactivate Enzymes, Equipment Design

1. Introduction
The main purpose of fixation is to destruct and passivate the activity of oxidase in foliage through high temperature, so as to inhibit the enzymatic oxidation of tea polyphenols. By evaporating part of the water in leaves, fresh tea leaves will get soft, which is easy to be rolled into shapes. Meanwhile, it enables tea leaves to form high-quality aroma [1]. The relevant equipment has no flue gas disposing function, resulting in leaves' going bad by mixing with the gas. It will also increase the cost, reduce efficiency and practicality of the equipment [2].

2. The Overall Design Scheme and Operating Principle
(1) The purpose of this design is to provide a design of a piece of equipment to deactivate enzymes in foliage by baking. It has a good effect of flue gas filtration which can solve the problem of leaves' going bad after mixing with the gas in the existing relevant equipment where there isn't a flue gas disposing function. In order to achieve the above goals, this design provides the following technical solutions: The equipment contains a baking box. The top of the baking box is fixedly connected with a processing box, whose back side of the inner wall is fixedly connected with a motor. The output end of the motor is fixedly connected with a turntable. The left side of the front of the turntable is fixedly connected with a joint lever. The left side of the front of the joint lever is fixedly connected with a joint pin. A fixed box is sleeved on the bottom of the inner wall of the processing box corresponding to the position of the turntable. The top and bottom of the inner wall of the fixed box are slidably connected to a sliding column, corresponding to the position of the turntable. The inner side of the sliding column is fixedly connected with a D-ring. The front side of the joint pin is slidably connected...
with the backside of the D-ring. The right side of the D-ring is fixedly connected with a transmission mechanism [3].

(2) Optimal, the transmission mechanism comprises a fixed strut. The right side of the fixed strut is fixedly connected with a push plate. The top of the fixed strut is fixedly connected with a support frame. The top of the support frame penetrates the top of the fixed box. The front side of the support frame is fixedly installed with a draught fan. The top of the draught fan is connected with a connecting pipe, which penetrates into the inside of the baking box.

(3) Optimal, the top and bottom of the inner wall of the fixed box are provided with sliding grooves, which are corresponding to the position of the sliding column. The length of the sliding grooves is longer than the moving distance of the sliding column. There are two sliding grooves, which are evenly distributed, and are used in conjunction with the sliding column.

(4) Optimal, the top and bottom of the right side of the inner wall of the fixed box are fixedly connected with springs. There are two springs that are evenly distributed. The left side of each spring is fixedly connected with the right side of the push plate. The springs are used in conjunction with the push plate.

(5) Optimal, the surface of the D-ring is provided with a sliding rail. The gap between the sliding rail and the joint pin shall not be greater than 0.2 mm. The sliding rail is used in conjunction with the joint pin.

(6) Optimal, both the top of the fixed box and the top of the processing box are provided with openings, the length of which is greater than the moving distance of the support frame. The openings are used in conjunction with the support frame.

The equipment to deactivate enzymes in foliage by baking contains a baking box. The top of the baking box is fixedly connected with a processing box. In this design, the user starts the motor, the output end of the motor rotates to drive the turntable to rotate. The rotation of the turntable drives the joint lever to rotate. The rotation of the joint lever not only drives the joint pin to rotate, but also moves the D-ring to the right with the help of the slide rail. This movement makes the sliding column have the limit movement to the right by the sliding grooves. It pushes the fixed strut and push plate to move to the right. While the push plate moves to the right and compresses the springs, the fixed strut drives the support frame and the draught fan to move to the right. Finally, the draught fan is launched to absorb and filter the flue gas inside the baking box in conjunction with the connecting pipe. It can solve the problem that the existing relevant equipment has no flue gas disposing function, resulting in leaves’ going bad by mixing with the gas. It can also help users reduce cost, improve efficiency and practicability of the equipment [4].

3. Design of Key Components
The equipment to deactivate enzymes in foliage by baking contains a baking box (1). The characteristics are: The top of the baking box (1) is fixedly connected with a processing box (2), whose back side of the inner wall is fixedly connected with a motor (3). The output end of the motor (3) is fixedly connected with a turntable (4). The left side of the front of the turntable (4) is fixedly connected with a joint lever (5). The left side of the front of the joint lever (5) is fixedly connected with a joint pin (6). A fixed box (7) is sleeved on the bottom of the inner wall of the processing box (2) corresponding to the position of the turntable (4). The top and bottom of the inner wall of the fixed box (7) are slidably connected to a sliding column (8), corresponding to the position of the turntable (4). The inner side of the sliding column (8) is fixedly connected with a D-ring (9). The front side of the joint pin (6) is slidably connected with the backside of the D-ring (9). The right side of the D-ring (9) is fixedly connected with a transmission mechanism (10) [5].

According to the design requirement 1, the characteristics of the equipment are: The transmission mechanism (10) comprises a fixed strut (101). The right side of the fixed strut (101) is fixedly connected with a push plate (102). The top of the fixed strut (101) is fixedly connected with a support frame (103). The top of the support frame (103) penetrates the top of the fixed box (7). The front side
of the support frame (103) is fixedly installed with a draught fan (104). The top of the draught fan (104) is connected with a connecting pipe (105), which penetrates into the inside of the baking box (1).

According to the design requirement 1, the characteristics of the equipment are: The top and bottom of the inner wall of the fixed box (7) are provided with sliding grooves (11), which are corresponding to the position of the sliding column (8). The length of the sliding grooves (11) is longer than the moving distance of the sliding column (8). There are two sliding grooves (11), which are evenly distributed, and are used in conjunction with the sliding column (8).

According to the design requirement 2, the characteristics of the equipment are: The top and bottom of the right side of the inner wall of the fixed box (7) are fixedly connected with springs (12). There are two springs (12) that are evenly distributed. The left side of each spring (12) is fixedly connected with the right side of the push plate (102). The springs (12) are used in conjunction with the push plate (102).

According to the design requirement 1, the characteristics of the equipment are: The surface of the D-ring (9) is provided with a sliding rail (13). The gap between the sliding rail (13) and the joint pin (6) shall not be greater than 0.2 mm. The sliding rail (13) is used in conjunction with the joint pin (6).

According to the design requirement 2, the characteristics of the equipment are: Both the top of the fixed box (7) and the top of the processing box (2) are provided with openings (14), the length of which is greater than the moving distance of the support frame (103). The openings (14) are used in conjunction with the support frame (103) [6].

4. The Beneficial Effect of this Design Compared with the Existing Technology

4.1. The Overall Design
In this design, a baking box, a processing box, a motor, a turntable, a joint lever, a joint pin, a fixed box, a sliding column, a D-ring and a transmission mechanism work with each other. The user starts the motor, the output end of the motor rotates to drive the turntable to rotate. The rotation of the turntable drives the joint lever to rotate. The rotation of the joint lever not only drives the joint pin to rotate, but also moves the D-ring to the right with the help of the slide rail. This movement makes the sliding column have the limit movement to the right by the sliding grooves. It pushes the fixed strut and push plate to move to the right. While the push plate moves to the right and compresses the springs, the fixed strut drives the support frame and the draught fan to move to the right. Finally, the draught fan is launched to absorb and filter the flue gas inside the baking box in conjunction with the connecting pipe. It can solve the problem that the existing relevant equipment has no flue gas disposing function, resulting in leaves’ going bad by mixing with the gas. It can also help users reduce cost, improve efficiency and practicability of the equipment [7].

4.2. The Design of the Sliding Grooves
Through the setting of the sliding grooves, this design can make the slide column move left and right inside the sliding grooves, and at the same time play a role of limiting displacement, avoiding the phenomenon of sloshing during the movement of the slide column, reducing the friction of the slide column inside the grooves, which can increase the service life of the slide column.

4.3. The Design of the Springs
The design of setting of the springs can assist the push plate to work, at the same time play the role of vibration reduction and restoration. It can also avoid the noise of the push plate in the process of moving caused by shaking, which can increase the stability of the push plate.

4.4. The Design of the Sliding Rail
The design of setting the slide rail can make the joint pin move inside the slide rail and fix the joint pin at the same time. It can avoid that the joint pin disconnects in the process of moving, reducing the
friction of the joint pin inside the slide rail. In this way, the service time of the joint pin can be extended.

4.5. The Design of the Openings
The design of the openings can enable the support frame to carry out mechanical transmission completely through the openings, and keep the support frame from bumping against the edge of the openings because of the openings’ shortness.

![Figure 1. The Schematic Diagram of the Design](image1)

![Figure 2. Section View of the Structure of the Processing Box in Figure 1](image2)

![Figure 3. Right View of the Structure of the Baking Box in Figure 1](image3)

In the diagram: 1. baking box 2. processing box 3. Motor 4. turntable 5. joint lever 6. joint pin 7. fixed box 8. sliding column 9. D-ring 10. transmission mechanism 101. fixed strut 102. push plate 103. support frame 104. draught fan 105. connecting pipe 11. sliding grooves 12. springs 13. sliding rail 14. Openings
5. Performance Test of the Equipment

The technical solution in this design embodiment will be clearly and completely described below in conjunction with the drawings in this design embodiment.

The equipment contains a baking box 1. The top of the baking box 1 is fixedly connected with a processing box 2, whose back side of the inner wall is fixedly connected with a motor 3. The output end of the motor 3 is fixedly connected with a turntable 4. The left side of the front of the turntable 4 is fixedly connected with a joint lever 5. The left side of the front of the joint lever 5 is fixedly connected with a joint pin 6. A fixed box 7 is sleeved on the bottom of the inner wall of the processing box 2 corresponding to the position of the turntable 4. The top and bottom of the inner wall of the fixed box 7 are slidably connected to a sliding column 8, corresponding to the position of the turntable 4. The top and bottom of the inner wall of the fixed box 7 are provided with sliding grooves 11, which are corresponding to the position of the sliding column 8. The length of the sliding grooves 11 is longer than the moving distance of the sliding column 8. There are two sliding grooves 11, which are evenly distributed, and are used in conjunction with the sliding column 8. Through the setting of the sliding grooves 11, this design can make the slide column 8 move left and right inside the sliding grooves 11, and at the same time play a role of limiting displacement, avoiding the phenomenon of sloshing during the movement of the slide column 8, reducing the friction of the slide column 8 inside the grooves 11, which can increase the service life of the slide column 8. The inner side of the sliding column 8 is fixedly connected with a D-ring 9. The surface of the D-ring 9 is provided with a sliding rail 13. The gap between the sliding rail 13 and the joint pin 6 shall not be greater than 0.2 mm. The sliding rail 13 is used in conjunction with the joint pin 6. The design of setting the slide rail 13 can make the joint pin 6 move inside the slide rail 13 and fix the joint pin 6 at the same time. It can avoid that the joint pin 6 disconnects in the process of moving, reducing the friction of the joint pin 6 inside the slide rail 13. In this way, the service time of the joint pin 6 can be extended. The front side of the joint pin 6 is slidably connected with the backside of the D-ring 9. The right side of the D-ring 9 is fixedly connected with a transmission mechanism 10. The transmission mechanism 10 comprises a fixed strut 101. The right side of the fixed strut 101 is fixedly connected with a push plate 102. The top of the fixed strut 101 is fixedly connected with a support frame 103. The top of the support frame 103 penetrates the top of the fixed box 7. The front side of the support frame 103 is fixedly installed with a draught fan 104. The top of the draught fan 104 is connected with a connecting pipe 105, which penetrates into the inside of the baking box 1. The top and bottom of the right side of the inner wall of the fixed box 7 are fixedly connected with springs 12. There are two springs 12 that are evenly distributed. The left side of each spring 12 is fixedly connected with the right side of the push plate 102. The springs 12 are used in conjunction with the push plate 102. The design of setting of the springs 12 can assist the push plate 102 to work, at the same time play the role of vibration reduction and restoration. It can also avoid the noise of the push plate 102 caused by shaking in the process of moving, which can increase the stability of the push plate 102. Both the top of the fixed box 7 and the top of the processing box 2 are provided with openings 14, the length of which is greater than the moving distance of the support frame 103. The openings 14 are used in conjunction with the support frame 103. The design of the openings 14 can enable the support frame 103 to carry out mechanical transmission completely through the openings 14, and keep the support frame 103 from bumping against the edge of the openings 14 because of the openings' shortness.

The user starts the motor 3, the output end of the motor 3 rotates to drive the turntable 4 to rotate. The rotation of the turntable 4 drives the joint lever 5 to rotate. The rotation of the joint lever 5 not only drives the joint pin 6 to rotate, but also moves the D-ring 9 to the right with the help of the slide rail 13. This movement makes the sliding column 8 have the limiting displacement to the right by the sliding grooves 11. It pushes the fixed strut 101 and the push plate 102 to move to the right. While the push plate 102 moves to the right and compresses the springs 12, the fixed strut 101 drives the support frame 103 and the draught fan 104 to move to the right. Finally, the draught fan 104 is launched to absorb and filter the flue gas inside the baking box 1 in conjunction with the connecting pipe 105 [8].
In conclusion, in the equipment to deactivate enzymes in foliage by baking, a baking box 1, a processing box 2, a motor 3, a turntable 4, a joint lever 5, a joint pin 6, a fixed box 7, a sliding column 8, a D-ring 9 and a transmission mechanism 10 are working with each other. The user starts the motor 3, the output end of the motor 3 rotates to drive the turntable 4 to rotate. The rotation of the turntable 4 drives the joint lever 5 to rotate. The rotation of the joint lever 5 not only drives the joint pin 6 to rotate, but also moves the D-ring 9 to the right with the help of the slide rail 13. This movement makes the sliding column 8 have the limiting displacement to the right by the sliding grooves 11. It pushes the fixed strut 101 and push plate 102 to move to the right. While the push plate 102 moves to the right and compresses the springs 12, the fixed strut 101 drives the support frame 103 and the draught fan 104 to move to the right. Finally, the draught fan 104 is launched to absorb and filter the flue gas inside the baking box 1 in conjunction with the connecting pipe 105. It can solve the problem that the existing relevant equipment has no flue gas disposing function, resulting in leaves' going bad by mixing with the gas.

6. Conclusion
The purpose of this design is to provide a design of a piece of equipment to deactivate enzymes in foliage by baking. It has a good effect of flue gas filtration which can solve the problem of leaves' going bad after mixing with the gas in the existing relevant equipment where there isn't a flue gas disposing function.

Acknowledgement
Foundation project: The project of Yunnan Provincial Department of Education on the implementation of Biological education construction of high-level key majors in Yunnan higher vocational education. Issued by the Education Department of Yunnan Province [2018] 83.

References
[1] Jiabao Wang, Cheng Chen, Feng Wang, et.al. Effects of different whipping times and emulsifiers on surface bubbles formation of sponge cake [J]. Food & Machinery, 34 (10), pp.08-13, 2018.
[2] Liang Guo, Yongqing Xu, Sanying Zhou, et.al. Improvement of the performance of household semi-automatic drum-type machine for deactivation of enzymes in tea [J]. Shangdong Chemical Industry, 378 (08), pp.144, 2020.
[3] Limin Sun, Hetao Zhao. The 6CSM-50 machine for deactivation of enzymes in tea [J]. Tea Machinery Magazine, 000 (02), pp.2, 1997.
[4] Hua Fang, Yinghan Zhao, Chi Wang. The fuzzy adaptive control in the application of deactivation of enzymes in tea [J]. Journal of Chinese Agricultural Mechanization, 34 (03), pp.21-24, 2013.
[5] Feng Liu, Weiping Yang, Junyong Luo, et.al. Design and test of the machine for deactivation of enzymes in tea [J]. Journal of Nanchang Institute of Technology, 35 (04), pp.39-43, 2016.
[6] Anonymity. Zhejiang Songyang's new equipment for deactivation of enzymes in tea helps to save time and labor of tea cooking [J]. China Tea, 05, pp.35, 2015.
[7] Qi’ai Quan, Zuowei Yao. Application of microwave heating technique in tea processing (continued) [J]. 28 (03), pp.15-16, 2006.
[8] Bin Shen, Xian Zhang, Zhangfeng Zhao, et.al. Research on double closed-loop control system of deactivation of enzymes in tea based on fuzzy PID [J]. Journal of Mechanical & Electrical Engineering, 30 (10), pp.03, 2013.