Development and Design of Water Surface Type Filtration and Sterilization Device

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Abstract. Some lighter foreign matters or dust will float on the water surface. The existing filter device can not effectively filter these floating foreign matters or dust. Therefore, the purpose of this study is to design a surface filtration and sterilization device, hoping to provide hot spring, massage pool and swimming pool operators with good performance in water quality management. The structure of the design content includes: the tank body, which has a movable hatch cover, a central filter pipe and a filter screen layer, the filter material structure which is detachable, and a purified water output pipe connecting the holding space and the outside, and the water outlet is arranged at the bottom of the tank body, and the filtered and sterilized pool water is led into the purified water pipe for transmission through the central filter pipe and the filter material structure through the suction of the motor And then discharged into the pool water.

1. Introduction
In general swimming pools, public bathrooms, hot spring areas and other places, due to the large number of users, and the different health habits of each person, plus the large-scale and large-scale exposure to the outside, and even some are open-air places, it is inevitable that various foreign matters, dirt, dust and other pollution sources will enter the water, and with the flow of water, they will flow everywhere. It will not only hinder the view, but also pollute the water quality. The quality of hot springs will be affected by changes in the quality of hot springs, pollution of the quality of hot springs, and drop in water temperature [1]. The study indicates that more than 80% of the respondents are worried about bacterial infection [2]. The number of bacteria in hot spring water and E. coli can be used as one of the indicators of whether the water quality is hygienic [3]. If the water source is contaminated, it may cause excessive bacteria breeding in the water. The turbidity of the water quality of the hot spring pool is related to the amount of pollutants generated [4]. Therefore, whether the water quality of hot springs is safe or not is the focus of people's concern when soaking in soup. Circulating water is disgusting, but it helps to save resources and conforms to the concept of environmental protection [5]. In order to solve the problem of water quality variation caused by ground oxidation and injection of pollution sources, it is necessary to deeply analyze and explore its related influencing factors and explore the level of hot spring water quality management technology. In order to reach the standard value of health and safety, it is necessary to actively develop surface filtration and sterilization devices to make the water surface cleaner. Therefore, based on the above background and...
motivation, the purpose of this study is to develop a surface filtration and sterilization device, hoping to provide hot spring, massage pool and swimming pool operators with good performance in water quality management.

2. Concept design of water surface type filtration and sterilization device

2.1 Technical field
This research and development design is related to a kind of water surface filtration and sterilization device which can effectively remove the sundries and dust suspended on the water surface to maintain the cleanness of water quality. The utility model relates to a surface filter sterilization device for a hot spring, a massage pool and a swimming pool; more specifically, the utility model is a filter sterilization device for collecting pollution sources on the water surface.

2.2 Prior technology
Generally, a circulating water filtration device is set in the pool to filter impurities in the water and keep the water clean; however, the filter device can only filter impurities in the water, some lighter foreign matters or dust, etc., which will float on the water surface, and the filter device can not effectively filter these floating foreign matters or dust on the water surface. Therefore, overflow holes are generally set around the swimming pool, public bathroom, hot spring area and other places to let the floating objects on the water surface, such as foreign matters, dirt, etc., be discharged through the overflow holes by the fluctuation of water level; in addition, the service personnel will be regularly invited to use other tools to pick up all kinds of foreign matters floating on the water surface. However, far away from the overflow hole, it is relatively unable to effectively discharge the foreign matters and oil dirt on the water surface. In addition, the way of using human resources to remove them is not only time-consuming and labor-consuming, but also increases the cost of personnel, so that how to effectively and conveniently remove the suspended solids on the water surface has become a major issue for the industry. At present, there are quartz sand, diatomite, large and small sand and stone in the filtering material of pool water, while the sterilization methods include CL series, O3, ClO2, Electrolysis, UV, Ag ions and so on [6] [7] [8].

2.3 Research design description
The utility model relates to a water surface filtering and sterilizing device, which is suitable for the circulating filtering and sterilizing of the water surface of swimming pools and hot springs. The structure of the device comprises: a can body, which comprises a can body and a containing space covered by the can body, the can body is provided with a movable hatch cover; a central filter pipe and a filter screen layer, which are concentric with the can body, are arranged in the containing space, the central filter pipe has a water inlet, a pipe wall of the central filter pipe and the filter layer is provided with a plurality of filter holes; the filter material structure is detachable, which is arranged on the wall of the central filter tube and between the filter layers with the same axis as the central filter tube, and is wrapped around the periphery of the pipe wall of the central filter tube; and the clean water output pipe connecting the containing space and the outside is arranged on the side of the central filter tube, and the water outlet is arranged at the bottom of the barrel body and passes through the horse. The suction function of the utility model leads the pool water filtered by the central filter pipe and the filter material structure into the purified water output pipe, and the purified water output pipe discharges the purified water into the pool water.

2.4 Implementation mode of water surface type filtration and sterilization device
In order to make the features and advantages of the device more obvious and easy to understand, the following was a specific example and a detailed description in combination with the attached formula. Please also refer to Figure 1 to 4. Figure 1 was the structural diagram of the first embodiment of the device; Figure 2 is the sectional diagram of the device according to the first embodiment of the invention; and Figure 3 and 4 are the flow direction diagram according to the first embodiment of the device. In Figure 1, in this embodiment, the water surface filter sterilization device was applicable to
the pool surface water circulating filter sterilization of swimming pools and hot springs. Its structure includes: can body 110, which includes the can body and the containing space covered by the can body, the can body has a movable hatch cover 150; the central filter pipe 120 and a filter layer 130 were arranged in the containing space with the same axis as the can body 110, and the central filter pipe 120 and the filter layer 130 are arranged in the containing space 120 has a water inlet 121, the wall of the central filter tube 120 and the filter screen layer 130 are provided with a plurality of filter holes. The filter material structure 140 was detachable and arranged between the central filter tube 120 and the filter screen layer 130 on the same axis with the central filter tube 120, and the filter material structure 140 was wrapped around the periphery of the first tube wall of the central filter tube 120. The filter material structure 140 includes three filter material layers arranged concentrically, and the structure includes: the first filter material layer 141, the second filter material layer 142 and the third filter material layer 143 from the outside to the inside. The first filter material layer 141 is a cylindrical cloth layer, the second filter material layer 142 was an antibacterial cloth using titanium dioxide nano silver antibacterial dyeing and finishing powder, the second filter material layer 142 can be a star structure or a circular structure, and the third filter material layer 143 was a cylindrical cloth layer; wherein, the first filter material layer 141 was made of non-woven material, which is wrapped on the outside of the second filter material layer 142, and the third filter material layer 143 was made of non-woven material. The cloth material is fixed in the interior of the second filter material layer 142. However, the clean water output pipe 160 connecting the holding space and the outside world, the water inlet 162 of the clean water output pipe set at the side of the central filter pipe, and the water outlet 161 set at the bottom of the barrel body, through the suction action of the motor 170, the pool water filtered by the central filter pipe 120 and the filter material structure 140 was led into the clean water output pipe 160, and the purified water output pipe 160 was discharged into the pool water (as shown in Figure. 3 and Figure. 4). In this embodiment, the backwashing system is used for cleaning the central filter pipe 120, and was respectively connected with the hot spring water input pipe and the hot spring water output pipe by two ends of the backwashing pipe, and is respectively provided with a water stop valve for switching the water path at the position where the hot spring water input pipe and the hot spring water output pipe were connected. In this embodiment, the pressure gauge is set on the can body to display the pressure of the water flow inside the can body as the basis of whether the back washing was carried out.

Figure 1. Filtration sterilization device exploded view

Figure 2. Filtration sterilization device Structure diagram
3. Conclusion
The main feature of this work is that the pool water of hot spring, massage pool and swimming pool is filtered and sterilized by the surface filtration and sterilization device. In the embodiment, the antibacterial cloth of the star titanium dioxide nano silver antibacterial dyeing and finishing powder is used as the second filter material layer of the filter material structure design of the filter material layer, which can greatly increase the sterilization area and achieve the high-efficiency sterilization effect of the pool water; in the embodiment, the backwash system can be set, which can backwash the device and flush out the impurities stuck in the filter material structure to extend Service life of the filter material structure: after repeated filtration, sterilization and backwashing, when the filtration and sterilization effect begins to decline, good filtration and sterilization effect can be recovered by replacing the new filter material structure without replacing the filtration and sterilization equipment, which can greatly reduce the cost in use and maintenance.

4. References
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