Self-Cleaning Germicidal Door Handle

Prevent pathogen transmissions via automatic disinfection of high-touch surfaces

Surfaces such as doorknobs, levers, or handles – especially those in public or high-traffic areas – are known to harbor bacteria and viruses. Studies have shown that SARS-CoV-2, the virus responsible for COVID-19, can survive for up to three days on plastic and stainless-steel surfaces, two materials that are commonly used to manufacture these high-touch surfaces. Thus, when contaminated, these surfaces facilitate the transmission of harmful pathogens. Ordinary cleaning agent wipes and sprays are simple methods to sanitize such surfaces; however, continuous maintenance of high-traffic areas is costly and logistically challenging. New methods are needed to rapidly disinfect such high-touch surfaces at low cost.

In response to this issue, engineers at NASA Marshall Space Flight Center developed the Ultraviolet Germicidal Door Handle. This invention is a compact and easy-to-install door lever or handle that performs automatic self-decontamination after each use.

**BENEFITS**

- **Rapid, automatic surface disinfection:** The UV-C light source kills pathogens rapidly, in part due to its close proximity to the handle surface. The light source is autonomously activated after handle use, and switches off after a brief disinfection process.

- **UV-C efficacy:** UV-C light damages pathogen nucleic acids (DNA, RNA). As a result, pathogens are unable to replicate and are inactivated/killed. UV disinfection systems have been widely used in hospitals and biological laboratories for over 75 years.

- **Functional design:** The UV-C germicidal device is easily removable for quick charging or battery replacement, and does not affect the primary function of the door handle.

- **Safe to use:** The far UV-C LED device is safe for hands and eyes due to the carefully designed orientation of the light beam and a time-delay feature that only disinfects the handle when not in use.
THE TECHNOLOGY

As previously mentioned, doorknobs, levers, and handles are commonly manufactured using plastic or stainless-steel materials. Since bacteria and viruses can survive for extended periods of time on such materials, these objects can facilitate the transmission of pathogens between users. Furthermore, it is burdensome and costly for organizations to implement cleaning protocols where door handles are cleaned continuously. To address this issue, UV sterilization systems have been used for door handles. However, such systems often require bulky mounting equipment, possess sub-optimal aesthetics, and are high price point products – leaving significant room for improvement.

To overcome the limitations of using cleaning agents, sprays, or bulky high-cost sterilizing systems, NASA developed an Ultraviolet Germicidal Door Handle. This invention largely resembles a conventional doorhandle; however, it contains a compact, far UV-C LED light device that attaches to the handle via mounting threads and disinfects surfaces (i.e., kills or inactivates pathogens). The device is controlled by a sensor that activates the UV-C light for a specified time to disinfect the surface after each use. After disinfection is completed, a timer sequence switches the light off and prepares for the next use. Due to the simple, thread-based mounting system, the UV-C LED is easily removable from the door handle. The UV-C LED has several convenient features including a USB charging port, I/O switch, and low battery indicator light.

The Ultraviolet Germicidal Door Handle greatly minimizes the risk of harmful pathogens, such as SARS-CoV-2, being transmitted between people using the same door. Various versions of the Ultraviolet Germicidal Door Handle could be marketed to accommodate different designs of door handles and levers.

APPLICATIONS

The technology has several potential applications:

- **Automatic disinfection of door handles:** This NASA invention enables automatic self-cleaning of door handles in public or otherwise highly trafficked buildings. Examples include industrial and commercial buildings, healthcare offices, hospitals, restaurants, and schools.

- **COVID-19 disinfection protocols:** NASA’s self-cleaning germicidal door handle can help reduce the transmission of the SARS-CoV-2 virus, without requiring burdensome manual disinfection.

PUBLICATIONS

Patent Pending