Covering for Operations during Viral Emergency Response(COVER)(2020-063)

Portable, negative pressure hood prototype to protect patients and staff anywhere in the hospital

Market Overview

With over 40 million surgical and non-surgical procedures performed each year, hospitals have addressed the need for the occasional isolation of patients during emergency and operating room procedures over concerns with infection or viral exposure. While flu season patients will always be a cause for concern, the Covid-19 pandemic overwhelmed hospital isolation rooms and has caused hospitals to cancel procedures due to onboarding of contagious patients, ultimately losing revenue. This has elevated the need for technology that limits viral spread and protects both the patient and care teams. Negative pressure rooms are designed to prevent spread, but hospitals have a limited number of rooms, and they do not prevent contamination of health care workers inside. There is currently no way to make the rooms portable, scalable, or adaptable for various clinical environments. To combat this problem, Clemson University researchers, along with healthcare workers from PRISMA Health have developed a novel, portable, negative pressure hood prototype that will protect both patients and staff. The personal, portable negative pressure environment will be a life-saving device on par with a portable defibrillator.

Technical Summary

The proposed COVER system utilizes a transparent tent-like hood that covers the head and torso of the patient and is connected to a suction-generating system designed to draw in air from both inside and surrounding the device across HEPA filters to remove 99.7% of all particles greater than 0.3um. For comparison, current guidelines recommend healthcare workers utilize N95 masks for high-risk procedures, and these masks only filter 95% of particles. The negative pressure chamber uses fans or a vacuum in an enclosed PVC structure to create a negative flow field. The fans or vacuum pull all air from inside the chamber through the HEPA filters before returning to the room environment. The HEPA filters prevent the infectious aerosolized particles from exiting the chamber, providing a barrier between contagious patients and the healthcare professionals and others outside the chamber.

Application

Isolation, Containment, Hospital, Ambulance, Viral

Development Stage

Prototype

Advantages

- Portable, can be used anywhere in the hospital
- Enables the reinstatement of bedside procedures, oral procedures and treatments currently prohibited due to risk of viral spread
- Hood is being designed to be cost-effective

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
N/A	United States	63/110,426	N/A	2020-063	John DesJardins Delphine Dean

About the Inventors

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Dr. John DesJardins is the Robert B. and Susan B. Hambright Leadership Professor of Bioengineering at Clemson University. He received his Ph.D. in Bioengineering from Clemson in 2006 and worked as a biomedical research engineer for over 25 years. Dr. DesJardins is the director of the Laboratory of Orthopaedic Design and Engineering at Clemson. He currently leads or is a co-PI on many multi-disciplinary research teams on projects funded through NASA, DoT, NSF, NIH, The Gates Foundation, biomedical industry, and other regional non-profit foundations. His research interests include Total Joint Replacement Design, Translational Orthopaedic Research, and Implant Retrieval Analysis.

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Dr. Delphine Dean is the Ron and Jane Lindsay Family Innovation Professor of Bioengineering at Clemson University. She received her Ph. D. in Electrical Engineering and Computer Science from MIT in 2005 and joined Clemson in 2007. She is the recipient of the 2011 Phil and Mary Bradley Award for Mentoring in Creative Inquiry for her work in mentoring undergraduates at Clemson. Her research interests include cardiovascular cell mechanics and interactions, dental cell and tissue characterization, evaluating the cytotoxicity of nanoparticles, and modulation of muscle-cell function using nanoparticles.

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