



System for collecting micro-hazardous substance liquid floating in air

A system for size-selective sampling of airborne fine particulate matter of harmful materials



Patent title Multi-stage filter device for size sorting of fine particles and collecting of liquid

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Patent application No. KR 10-2019-0029880 (2019.03.15)

Authority status Registered

Technicality

Technology overview

- This technology is a cyclone-type size-selective fine particle collection system to which liquid collection is applied, and the technology includes multiple stages to perform a role of a size-selective fine particle filter.
- A technology in which by controlling a rotation speed of a motor to a sampling flow rate and a particle collecting diameter of a cyclone, a sampling range can be adjusted, and a process of discharging a collected solution by using a circulation system, and then refilling a fresh solution can be performed according to the program settings.

Development background and problem to be solved

- A form of filtering fine substances in the air by using a cyclone or a filter in an existing air purifier and ventilation device is ensured. However, in the case of a filter, when a large amount of dust accumulates, performance changes such as an increase in a pressure load or a change in a suction flow are caused.
- In the case of a cyclone, periodic maintenance in the form of emptying a dust bin when the dust bin is full should be accompanied.

Excellence and discrimination of technology

Excellence of technology

- Through multi-stage configuration, it is possible to selectively collect fine particles with different diameters in each stage.
- It is possible to apply a measurement technology of filtering highly polluted substances in a liquid phase and collecting and concentrate micro-hazardous substances in a liquid phase to perform real-time monitoring.
- By reducing the level of contamination of a final filter, cleaning intervals and maintenance periods can be extended.

Discrimination of technology

- An omnidirectional cyclone allows flow suction in all directions.
- Performance is verified through virus capture and removal experiments.
- The technology can be used as a building air conditioner, an indoor air purifier, virus research equipment, or the like.

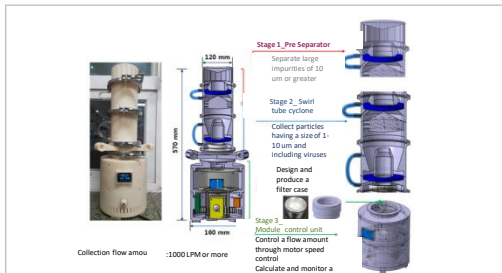


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Implementation method

- The technology includes a pre-filter, a cyclone unit, a collection solution storage unit, and a drive control unit.
- In the case of a general cyclone, a flow can be sucked in only one direction. However, an omnidirectional cyclone can suck a flow in all directions, and thus it is possible to reduce the bias of a result according to a sampling direction.



Picture 1 Liquid collection system



Picture 2 Core performance evaluation

Degree of technology completion (TRL)

Degree of technology completion: TRL4 (Lab Scale prototype development stage)

TRL1	TRL2	TRL3	TRL4	TRL5	TRL6	TRL7	TRL8	TRL9
Technical principle presentation	Technology concept setting	Technology concept verification	Lab Scale prototype development	Implementation environment application experiment	Full Scale prototype development	Quasi-commercial product development	Commercial product development	Commercial product implementation

Utilization

Utilization field and applied product

Utilization field

- Apartment air conditioning system
- Air cleaner



Figure 1 Air conditioning system

<Data: ECODOM>

Applied product

- Virus collector

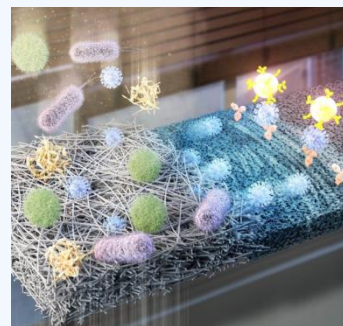


Figure 2 Virus collection

<Data: Korea Institute of Science and Technology (KIST)>



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Technology trend

- In the early days of an air conditioning system, integrated package units such as a window type or a wall mounted type were the mainstream, but the system has been expanded for buildings and is called a system air conditioner or a multi-air conditioner which is developing into a central system of air conditioners for buildings.
- A heat recovery ventilation device, of which R&D was initiated for the purpose of creating a comfortable and healthy indoor environment and reducing greenhouse gases in buildings, has experienced ups and downs due to defects, noise, efficiency, and effectiveness, but has continued to advance in the technology according to growing interests and enhanced systems and policies.
- Recently, a heat recovery-type ventilation device is evolving into a complex ventilation product by receiving demands for functions such as health, safety, and disease prevention in addition to existing ventilation and energy performance issues.

Family patent status

Application nation	Application No. (Application date) / Registration No.	Title of the invention
KOR	KR 10-2019-0029880 (2019.03.15)	Multi-stage filter device for size sorting of fine particles and collecting of liquid
KOR	KR 10-2019-0029881 (2019.03.15)	Cyclonic omnidirectional anterior filter and filtering device including same

Market prospect

Target market size and prospect

- The global air purifier market size is expected to reach about USD 10,800 million in 2021 at a CAGR of 12.39% from USD 5700 million in 2016.
- The domestic air purifier market size is expected to reach KRW 3.634 trillion in 2021 at a CAGR of 36.63% from KRW 765.1 billion in 2016.

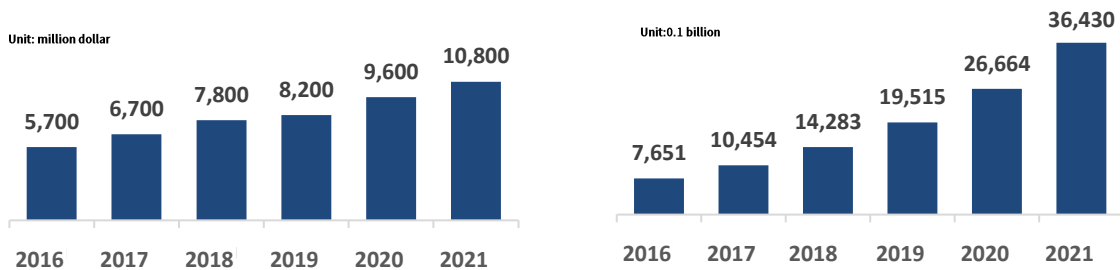


Table Global air purifier market (left) / Domestic air purifier market (right)

<Data: Small business technology road map 2018-2020 (smart home appliance)>

Technology transfer query

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Technology transfer query

