

Cleaning Robot System for Building



Hajime Aoyama

* 1 (1954)



Kazuyoshi Ishikawa

* 1 (1976)



Yoshinori Adachi

* 1 (1982)



Koichi Takato

* 2 (1942)



Itsuo Nishihara

* 2 (1945)

1. Outline

Cleaning robot system developed consists of mobile robot and cleaning unit and automatically cleans several floors in office buildings using the elevator.

The system can move from floor to floor by operating the elevator through wire-less communication or pushing operating buttons in an elevator cargo using attachment, which is previously installed by operator. After finishing all its given work for the day, the robot returns to the garage. For applying this system to practical use, many proof tests were performed in the office buildings. At the same time crash tests were conducted using dummy puppet and finally safety was assured. The reduction of production cost has been achieved. Then a new market for practical use of cleaning robot system has been established.

2. Structure of system

An appearance of cleaning robot is shown in Fig.1 and specifications are listed in Table 1. The strong appeal points of the cleaning robot are follows: 1)people-friendly round shape, 2)simplified mechanism based on driving straight ahead and spin-turn, 3)reduction of sensors, 4)driving without a detailed map information from any locations, 5)driving straight ahead through the angle of gyro error correction.

Two robot systems are developed for newly constructed buildings and existing buildings. Operating process is shown in Fig.2. At new buildings, the robot communicates through the optical transmitter in the elevators and get on and off elevators. At the existing buildings, an actuator panel (push-button type) is attached on the control board in the elevators by the operator before the cleaning, so that the robot can operate the elevators using a PHS communications network system. This operation is the same as the push button is used to move the elevator like human. Optical transmission system has been standardized for five major elevator manufacturers.

Regarding cleaning techniques, a highly efficient structure of suction nozzle is developed through 3D flow analysis, and highly efficient dust filter suitable for clean rooms in a pharmaceutical company is also developed (see Figs.4 to 7).

3. Summary

The system developed is the only commercialized

robot cleaning system for practical use. About 60 systems have been employed and operated safely in many skyscrapers (shown in Fig.3), international airports, pharmaceutical companies, apartment buildings and so on.

* 1 Member, Fuji Heavy Industries Ltd.(〒320-8564 1-1-11, Yonan, Utsunomiya)

* 2 Fuji Heavy Industries Ltd.(〒320-8564 1-1-11, Yonan, Utsunomiya)



Fig.1 Cleaning robot

Table1. Specifications.

Item	Contents
Length	850mm
Width	720mm
Height	1125mm
Weight	160kg (include Battery)
Function	Suction type, with side brush

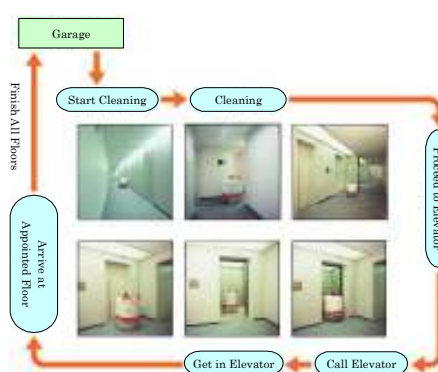


Fig.2 Cleaning process



Fig.3 Roppongi Hills (right side building).



Fig.4 Suction nozzle



Fig.5 Analysis model of suction nozzle.



Fig.6 Blower with filter.

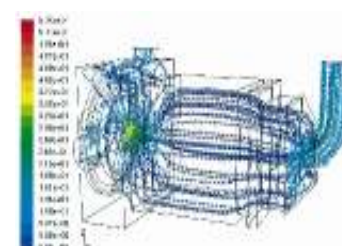


Fig.7 Analysis of blower flow.