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Research On The Air Circulation System Of A Business Machine

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***Abstract*—The air circulation is an important part in the internal operation of a business machine. In addition to the installation of a forced fan, the most basic principle of air circulation is to use the principle of air buoyancy ventilation. The principle of buoyancy ventilation is to use the warm air to rise and the cold air to fall, that is, the air inlet is lowered and the air outlet is raised. The fresh cold air is sucked in by the fan from the base of the business machine, respectively the hot air is discharged from the upper end of the business machine. At the present, the heat exhaust fan of the business machine adopts jet circulation. The driving force inside the machine is a double- roller bearing heat dissipation motor. The double-roller bearing heat dissipation motor is made by combining the concept of aero- hydrodynamics and can be cooled quickly. Although the price of this kind of motor is relatively high, but the effect is excellent and can exhaust the odor. This kind of motor is conductive to the collection of toner and the elimination of dust inside the business machine.**

Keywords—forced fan, principle of air buoyancy ventilation, jet circulation, double- roller bearing heat dissipation

I. Introduction:

The double-bearing heat dissipation motor of a business machine has the following characteristics: ① automatically swing the head to left and right ②can adjust the pitch angle up and down ③three-stage wind speed ④jet convection speed. The air circulation system of a business machine can be divided into following parts: ① paper exit cooling fan ② development intake fan/right) ③development intake fan/left ④power supply unit(PSU) cooling fan ⑤ power supply unit(PSU) exhaust heat fan ⑥ozone exhaust fan ⑦thermistor ⑧drive cooling fan)⑨toner supply cooling fan ⑩fusing exhaust heat fan ⑪main exhaust fan.

II. Literature review:

Research on the air circulation system of a business machine, here are some example. In literature [1], Ricoh Taiwan company has finished a complete operation manual of the company's business machine, which is very detailed. In literature [2], Huang Zhenhan graduate student published "Design, manufacturing, analysis and experiment of air circulation shoe sole mechanism". Through the design of ventilated insoles in this paper, the amount of pressure on the ground that is exerted by humans when walking is used to make the circulation of air inside the ventilated insoles to exhaust the odor from the soles of the shoes. The above design concept is very similar to the forced exhaust design in this article.

In literature [3], Huang Zhenyu graduate student published “A study of the circulation of air flow in a high technology factory”. This paper is aimed at the air-condition and ventilation needs of the clean room design of high-technology factories. It can be used in semiconductors, liquid crystal screens, biochemical technology, precision machinery, pharmaceuticals, hospital and other industries. This design adjusts the pressure so that the room pressure is positive or negative to allow the air to circulate, and on the other hand, this deign adjust (lowers) the temperature to increase the weight of fine dust particles without flying. In literature [4], Lai Jianhong graduate student published “Study of the effect of air circulation on the reduction of temperature of the membrane structure”. The film structure is a new type of the building structure material. It consists of a variety of high-strength film materials and glass fiber membrane materials, PVC coatings and polyester fiber membrane materials.

III. The introduction of the overall business machine:

Fig.1 The appearance of a business machine

A. The fine construction of the air circulation system:

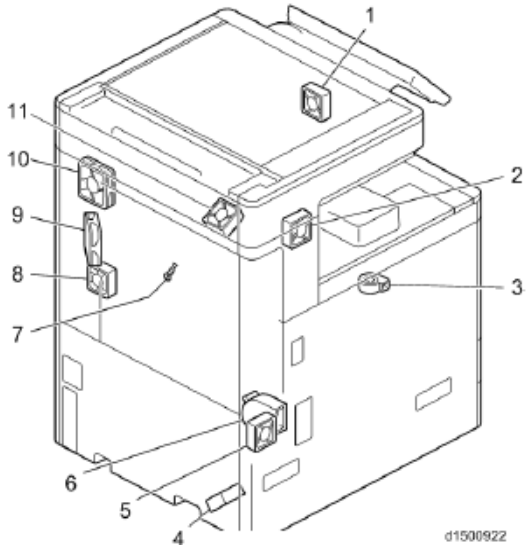

Fig.2 The detail diagram of the air circulation system

1.paper exit cooling fan 2.development intake fan/right 3.development intake fan/left 4.power supply unit(PSU) cooling fan 5.power supply unit(PSU) exhaust heat fan 6.ozone exhaust fan 7.Thermistor 8.drive cooling fan 9.toner supply cooling fan 10.fusing exhaust heat fan 11.main exhaust fan.

IV. The practical operation of the air circulation system of a business machine:

Fig.3 The inspection of the air circulation system

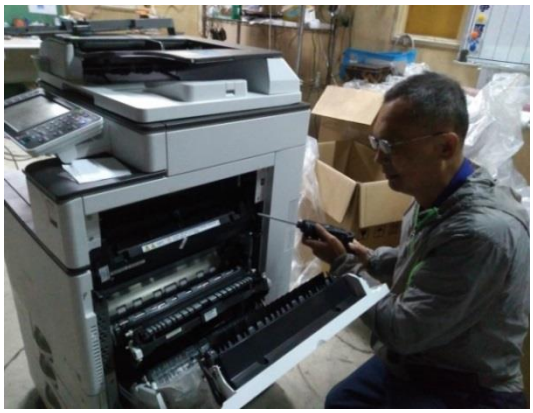

Fig.4 The testing of the air circulation system

V.The result of experiments of the air circulation system:

Fig.5 The paper exit cooling fan that has been repaired

Fig.6 The power supply unit cooling fan that has been repaired

Fig.7 The fusing exhaust heat fan that has been repaired

VI. Conclusion:

Comparing the new business machine with the old business machine, the new business machine has been improved a lot about the air circulation:

(1) There are many specifications and restrictions on the physical properties of the new type of business machines in the thermodynamics of the air. Its temperature ranges from 10^0C to 32^0C (50^0F~80^0F) and relative humidity ranges from 15% to 80% (15%~80%). These specifications are not available in the old machine.

(2) The new business machine has many specifications on the physics and aerodynamics of the air. In the illumination of ambient, the brightness should not exceed 1500 lux and do not directly exposed to direct sunlight especially. In terms of environmental ventilation, the indoor air turnover must be at least 30m^3 per person per hour. These specifications are not available in the old machine.

(3) New machines should avoid sudden changes in temperature in the area where they are placed. For example: the area that is placed in the refrigeration indoor is directly exposed to the cold air and the area placed in the heat pump indoor is directly heated.

(4) The area where the new machine is

placed should avoid direct exposure to corrosive gases and should also avoid to place in an area subjected to strong vibration.

VII. Reference:

[1] (2015),"Service manual of Ricoh university: learning, knowledge, performance", page 1-1~2-1, Ricoh Americas corporation, 1st edition.

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[4]Lia J.H., (2004), "*Study of the effect of air circulation on the reduction of temperature of the membrane structure"*, master's dissertation, Taipei, Taiwan, national Taiwan university of science and technology, department of construction engineering.