Journal of Multidisciplinary Engineering Science and Technology (JMEST)
ISSN: 2458-9403
Vol. 7 Issue 7, July - 2020

Research On The Paper Feeding System Of A Business Machine

Shih-Ping Hu
Department of mechanical engineering
Hungkuo Delin University of Technology
New Taipei City, Taiwan, Republic of China
hushihping@yahoo.com.tw

***Abstract*—In the 21st century with booming industry and commerce, the business machine is the most urgently needed machine in the office of all related companies. In the operation of business machines, the paper is the most expensive and the most consumable material. The cost of paper is a variable cost depending on the number of copies and the mode of copying. Although the changes in the price of international paper prices affect the cost is very large, but that is not our personal control (that is, uncontrollable). The excellent design of the paper feeding system and how to reduce the output of invalid paper is what we can do. Some examples; the process of displaying the paper conveyance on the LCD panel allows the user to clearly see the progress of the paper, avoiding the waste of the user repeatedly pressing the start button. The reason and location of paper jams are displayed on the LCD display to allow users to smoothly eliminate paper jams and avoid paper waste caused by overlapping more than two papers jams in the same position. According to the size of the manuscript, the paper size specifications are automatically displayed and the user is recommended to select the appropriate paper, etc.**

Keywords—paper feed sensor, limit sensor, transport sensor, tray set switch.

I. Introduction:

The main structure of the paper feeding system of the business machine is as follow: ①paper feed sensor ②limit sensor ③transport sensor ④tray set switch ⑤lift motor ⑥ registration sensor ⑦ size switch ⑧ anti-condensation heater ⑨ pick-up solenoid. It is particularly worth to mention that there are two paper tray designs. The first is the large capacity input tray (LCIT) and the second is the internal shift tray. The new machine is specially designed to automatically reverse the document feeding (ARDF) for double-sided photocopying.

II. Literature review:

Research on the paper feeding system of a business machine, here are a few papers as examples. 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], Xie Zhiyuan graduate student published "Discussion on the product line extension and company performance—a case study of business machine rental industry companies". This paper introduces the company management of the entire business machine rental industry. The content of this paper includes the improvement of the performance of the machine itself, the speed of supplementary consumable materials, the strength of routine maintenance, and the speed of the technicians response after the customer calls. These are the soft power of the rental industry. In literature [3], Zheng Shili graduate student published

"The application of knowledge management in the maintenance of business machine industry". This paper details the definition of knowledge management.

III. Explanation of principle:

Fig.1 The appearance of a business machine

A. The position of the paper feeding system in an business machine:

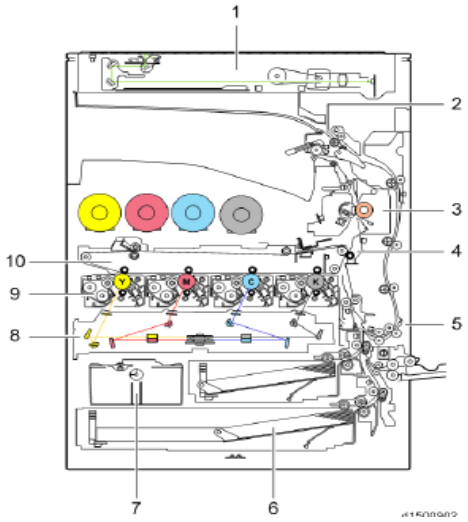

Fig.2 The main structure of a business machine

6.paper feeding unit

B. Names of every parts of the paper feeding system:

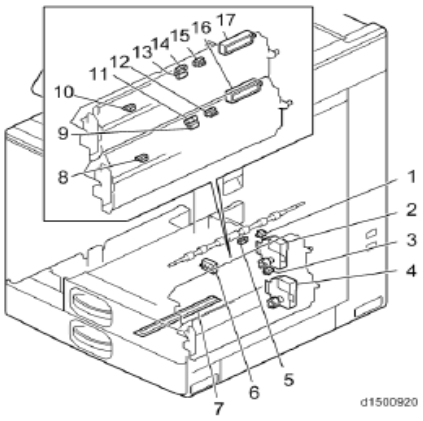

Fig.3 names of every parts of the paper feeding system

1.tray set switch (1st feed tray) 2.lift motor (1st feed tray) 3.tray set switch (2nd feed tray) 4.lift motor (2nd feed tray) 5.registration sensor 6.size switch (2nd feed tray) 7.anti-condensation heater 8.paper feed sensor (2nd feed tray) 9. Transport sensor (2nd feed tray) 10.paper feed sensor (1st feed tray) 11.paper end sensor (2nd feed tray) 12.limit sensor (2nd feed tray) 13.transport sensor (1st feed tray) 14.paper end sensor (1st feed tray) 15.limit sensor (1st feed tray) 16.pick-up solenoid (2nd feed tray) 17.pick-up solenoid (1st feed tray)

C. The performance of every parts of the paper feeding system:

1. Paper feed sensor: It is used to determine whether various sizes of paper (A_4, A_3, B_4, B_5, etc.) on the tray are in the place (lowest stock). The paper feed sensor returns the signal (direct micro current) to the microcomputer for user reference.

2. Limit sensor: It is used to determine the amount of paper on the tray.

3. Transport sensor: It is used to show whether the paper conveying process is smooth.

4. Tray set switch: It is used to sense the position of the tray.

5. Lift motor: It is used to roll up paper from the tray.

6. Registration sensor: It is used to lock the position of the paper.

7. Size switch: It is used to determine the size of the paper in the paper tray.

8. Anti-condensation heater: It is used to heat paper for the subsequent toner coloring.

9. Pick-up solenoid: It generates DC current by the magnet moving in the spiral coil and can clearly see the transmission of the paper roller.

D. paper transfer & paper exit:

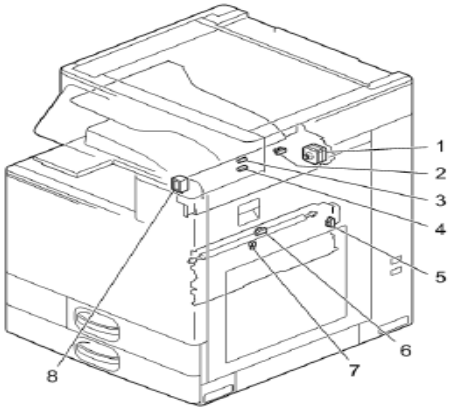

Fig.4 The paper transfer & paper exit

1.inversion motor 2.paper exit full sensor 3.inversion sensor 4.paper exit sensor 5.paper transfer roller home position sensor 6.fusing entrance sensor 7.fusing jam sensor 8.paper exit solenoid

IV. Practical operation of the paper feeding system of a business machine:

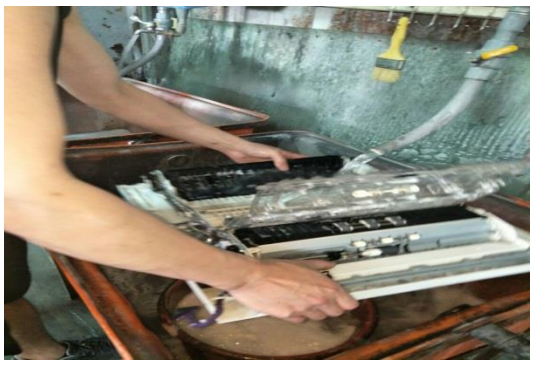

Fig.5 The inspection of the paper feeding system

Fig.6 The testing of the paper feeding system

V.The result of experiment of paper feeding system:

Fig.7 The lift motor of the paper feeding system after inspection

Fig.8 The automatic reverse document feeding (ARDF) of the paper feeding system

VI. Conclusion:

For the paper feeding system, the new type business machine has following improvements compared with the old type business machine.

(1) The new business machine

replaces the traditional online communication system (FRR system) with the radio frequency system (RF system) to improve the performance and simply the configuration.

(2) The paper capacity of new

business machine is from 52~300 g/m^2 better than the traditional paper capacity 52~256 g/m^2.

(3) In the detection of the paper tray

(specific sensor), the new machine replaces the traditional paper detection sensor with the "operating touch on the normal paper size position", so that the paper size can be extended.

(4) The new machine adopts the

double-feed detection instead of the traditional no double-feed detection to enable user to improve the chance of errors.

(5) The new machine adopts a

small size standard support instead of a small size tray option to increase the convenience of users.

(6) The design of the new

machine's paper dust box can make it easier for technicians to disassemble.

VII. Reference:

[1](2015), "Service manual of Ricoh university: learning, knowledge, performance", page 1-1~1-44, Ricoh Americas corporation, 1st edition.

[2]Xie Z.Y., (2014), "*Discussion on the product line extension and company performance—a case study of business machine rental industry companies",* master's dissertation, Changhua, Taiwan, national Changhua normal university, department of enterprise management.

[4]Zheng S.L., (2002), "*The application of knowledge management in the maintenance of business machine industry",* master's dissertation, Taipei, Taiwan, national defense university, Institute of national defense information.