

12

EUROPEAN PATENT APPLICATION

21 Application number: **84107775.3**

51 Int. Cl.⁴: **G 03 G 15/20**

22 Date of filing: **04.07.84**

30 Priority: **15.07.83 JP 129989/83**

43 Date of publication of application:
23.01.85 Bulletin 85/4

84 Designated Contracting States:
DE GB IT

71 Applicant: **SUMITOMO ELECTRIC INDUSTRIES LIMITED**
No. 15, Kitahama 5-chome Higashi-ku
Osaka-shi Osaka-fu(JP)

72 Inventor: **Katsuya, Hiroo c/o Kumatori Works**
Sumitomo Electric Ind., Ltd. No.950, Noda
Kumatori-cho, Sennan-gun, Osaka(JP)

72 Inventor: **Kato, Chiaki c/o Kumatori Works**
Sumitomo Electric Ind., Ltd. No.950, Noda
Kumatori-cho, Sennan-gun, Osaka(JP)

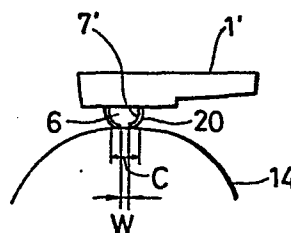
72 Inventor: **Fujii, Yoshiharo c/o Sharp Kabushiki Kaisha**
No. 22-22 Nagaike-cho
Abeno-ku, Osaka-shi, Osaka(JP)

74 Representative: **Patentanwälte Grünecker, Dr.**
Kinkeldey, Dr. Stockmair, Dr. Schumann, Jakob, Dr.
Bezold, Meister, Hilgers, Dr. Meyer-Plath
Maximilianstrasse 58
D-8000 München 22(DE)

54 Release agent applicator for copying machine.

57 An improved release agent applicator for use with a copying machine having a fixing device for pressure fusing a toner image to copy paper as the paper is passing between a fixing roll and pressure roll. The fixing roll has in contact therewith a porous sheet or tube of poly(ethylene tetrafluoride) resin through which the release agent is applied to the fixing roll. Pores in the areas of the porous sheet or tube of poly(ethylene tetrafluoride) resin which are not needed for passing release agent therethrough during normal copying operations are closed to form closed-and open-pore areas. A width of the open-pore area is smaller than the width of the surface that which the porous sheet or tube contacts the fixing roll. Preferably, the porous sheet or tube has a pore size in a range of 0.1 to 10 microns and a porosity in a range of 50 to 85%.

FIG. 4



RELEASE AGENT APPLICATOR FOR COPYING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a device for applying a release agent (for instance, silicone oil) to the fixing roll of a plain paper copying (PPC) machine.

The basic process of fixing in a PPC copying machine consists of pressure fusing a transferred toner image to sheet of paper as it is passed between a heated fixing roll and a resilient pressure roll such as a rubber roll. When the paper with a toner image is passed between the heated fixing roll and the resilient pressure roll, several problems occur, such as the paper sticking to the periphery of the fixing roll so as to prevent complete toner fixing, toner particles coming off the copy paper and being deposited on the fixing roll thereby producing a double image (this phenomenon usually being referred to as "offsetting"), and malfunction of the copying machine. While various methods have been proposed for solving these problems, they all depend on the application of a release agent that provides the fixing roll and elastic roll with good release properties.

However, a great deal of difficulty is involved in applying the release agent to the roll uniformly and in the

- 2 -

right amount. If the release agent is applied in excessive amounts, it either stains or discolors the paper, and at the same time, rapid consumption of the release agent requires its frequent refilling. Furthermore, the excess release agent solidifies on the roll surface and may cause unexpected troubles. If the amount of application of the release agent is insufficient, offsetting or deteriorated release properties of the roll surface will occur that induces the sticking of the paper to the periphery of the roll. Typical release agents are heat-resistant oils such as silicone oil.

Various types of release agent applicators have so far been proposed, but none of them are completely satisfactory. The applicant previously developed a release agent applicator that permits uniform application of the release agent, consumes a minimum amount of the agent, requires a very small installation area, and which is simple in shape and can be manufactured at a very low cost.

As shown in Figs. 1A, 1B and 2, this applicator is used with a fixing device composed of a fixing roll 14 and a pressure roll 15 between which copy paper 16 having a toner image is passed so as to pressure fuse the image to the paper. The applicator consists of a porous tube 7 of poly(ethylene tetrafluoride) resin which is heat sealed or

stoppered at both ends and placed in contact with the fixing roll 14 in its axial direction so as to enable the application of the release agent 6 from the porous tube of poly(ethylene tetrafluoride) resin.

Being soft, the porous tube 7 is carried on a support 1 (Figs. 1A and 1B) or 4 (Fig. 2) in such a manner that part of the tube projects from the opening of the support. The pores in the area of the porous tube other than the outlet for the release agent are closed with fluorine rubber or any other suitable material by, for example, a coating or covering technique, so as to produce a closed-pore area. This is done in order to discharge the release agent in a metered and uniform amount.

In Figs. 1A, 1B and 2, reference numeral 2 indicates the closed-pore area of the porous tube of poly(ethylene tetrafluoride) resin, 3 refers to the open-pore area of that tube, and 5 denotes an inlet for the release agent.

The inventors have also developed an applicator of the type shown in Fig. 3 by replacing the porous tube of poly(ethylene tetrafluoride) resin by a sheet of the same material as shown in Fig. 4. However, even these prior art applicators are not completely defect free. If the copying operation is suspended for a while with the power switch on,

- 4 -

an increased amount of the release agent will be discharged when the copying operation is resumed. This is because some amount of the release agent is discharged when the machine is at rest under elevated temperatures. When this occurs, the application of the release agent becomes excessive and causes the problems mentioned above in connection with over-application of the release agent.

SUMMARY OF THE INVENTION

The present invention has been accomplished to avoid the above-described problem, namely, discharge of the release agent while the copying machine is at rest under elevated temperatures.

The release agent applicator of the present invention for use with a copying machine has a fixing device for pressure fusing a toner image to copy paper as the latter is being passed between a fixing roll and a pressure roll. The fixing roll has in contact therewith a porous sheet or tube of poly(ethylene tetrafluoride) resin that is designed to permit application of a release agent. In accordance with the invention, the pores in the area of the porous sheet or tube of poly(ethylene tetrafluoride) resin which are not needed for discharge of the release agent are closed to form closed- and open-pore areas. The width of the open-pore area is smaller than the width of the surface

at which the porous sheet or tube contacts the fixing roll.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A shows a cross section of a release agent applicator previously developed by the present applicant;

Fig. 1B shows a front view of the applicator of Fig. 1A;

Fig. 2 shows another front view of the applicator of Fig. 1A;

Fig. 3 shows another cross section of the applicator of Fig. 1A; and

Fig. 4 is a side view illustrating a release agent applicator of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will hereunder be described in detail with reference to the accompanying drawings.

Fig. 4 illustrates a release agent applicator of the present invention that corresponds to the embodiment shown in Fig. 3. (The present invention is also applicable to the embodiments shown in Figs. 1A, 1B and 2.) In Fig. 4, reference numeral 7 indicates a porous sheet of poly(ethylene tetrafluoride) resin having fine pores with a uniformly controlled pore size, preferably in the range of 0.1 to 10 microns, and a porosity of 50 to 85%. Examples of such a resin sheet are described in Japanese Patent

Publication No. 13560/1967 and Japanese Patent Application No. 155226/1975. The sheet is manufactured by preparing a poly(ethylene tetrafluoride) resin mix containing a liquid lubricant, calendering the mix to a sheet form, drawing the sheet and sintering the drawn sheet. A commercial product of this porous sheet of poly(ethylene tetrafluoride) resin is Poreflon (trademark) available from Sumitomo Electric Industries, Ltd., of Japan.

The pores in the area of the sheet other than that which has open pores necessary for permitting the oozing of the release agent 6 are closed with FEP or other material 20. The sheet is installed on a tank (support) 1' in such a manner that the open-pore area of the sheet faces and contacts the fixing roll 14 (also see Fig. 3).

According to the present invention, in order to minimize the discharge of the release agent 6 from the porous sheet 7' while the copying machine is at rest under elevated temperatures, the width W of the open-pore area of the sheet 7' is made smaller than the width C of the surface at which the porous sheet 7' contacts the fixing roll 14.

For a better understanding of this feature of the present invention, experimental results are shown below with reference to Fig. 4. In the experiment, the width W of the open-pore area was set at values between 3 and 5 mm, and the

- 7 -

contact surface width C was set between 5 and 6 mm. Poreflon (trademark) mentioned above was used as the porous sheet 7'. In the experiment, the discharge of the release agent was found to be sufficiently prevented while the copying machine was at rest under elevated temperatures.

It should be understood that the shape of the tank or support to which the porous sheet or tube of the present invention is fixed is by no means limited to the embodiments shown in the accompanying drawings.

As shown above, the applicator of the present invention ensures satisfactory prevention of the release agent being discharged from the porous sheet or tube while the copying machine is at rest under elevated temperatures. As a result, application of excessive amounts of the release agent does not occur when the copying operation is resumed, which prevents the staining or discoloring of the paper by the release agent. As a further advantage, the rate of consumption of the release agent is reduced, and waste thereof is avoided. Also, frequent refilling or replacement becomes unnecessary. Other problems such as solidification of excess release agent on the roll surface are also minimized.

CLAIMS

1. In a release applicator agent for use with a copying machine having a fixing device for pressure fusing a toner image to copy paper as said paper is being passed between a fixing roll and a pressure roll, said fixing roll having in contact therewith a porous sheet or tube of poly(ethylene tetrafluoride) resin for applying a release agent to said fixing roll, the improvement wherein pores in areas of said porous sheet or tube of poly(ethylene tetrafluoride) resin which are not needed for passing release agent therethrough are closed to form closed- and open-pore areas, a width of said open-pore area being smaller than a width of a surface at which said porous sheet or tube contacts said fixing roll.

2. The release agent applicator for use with a copying machine according to claim 1, wherein said porous sheet or tube of poly(ethylene tetrafluoride) resin is installed on a support.

3. The release agent applicator for use with a copying machine according to claim 1, wherein said porous sheet or tube of poly(ethylene tetrafluoride) resin has a pore size in a range of 0.1 to 10 microns and a porosity in a range of 50 to 85%.

4. The release agent applicator for use with a

- 9 -

copying machine according to claim 1, wherein said closed-pore area of said porous sheet of poly(ethylene tetrafluoride) resin is formed by lamination with FEP.

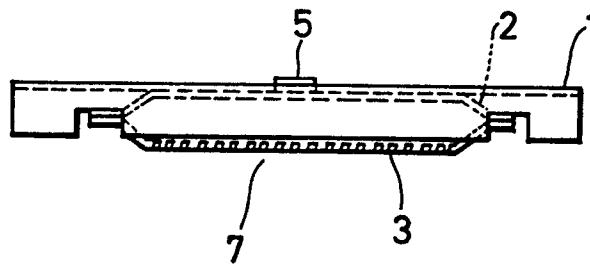
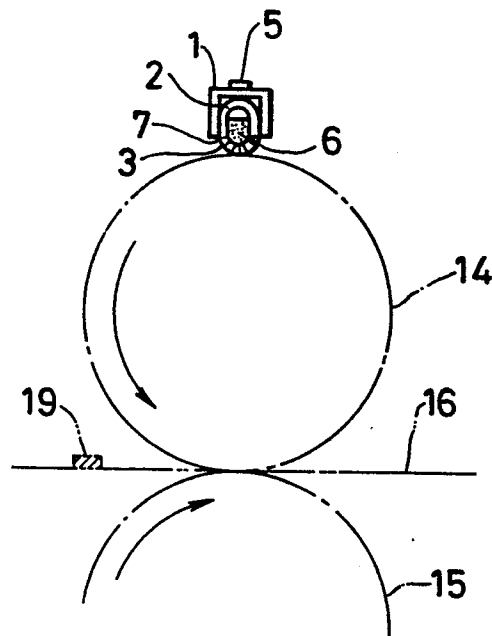
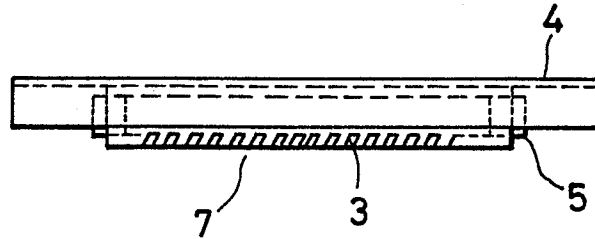
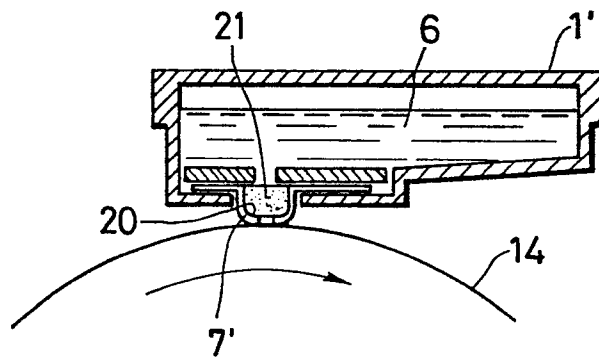
FIG. 1A**FIG. 1B**

FIG. 2**FIG. 3****FIG. 4**