United States Patent

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[72] Inventor **Susumu Tanaka**
Otsu, Shiga, Japan

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[73] Assignee **Minolta Camera Kabushiki Kaisha**
Osaka, Japan

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[33] **Japan**
[31] 42/95971

[54] **DEVICE FOR DRYING AND FIXING IN ELECTRONIC PHOTOCOPYING MACHINE**
4 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **355/3,** 95/89, 355/30
[51] **Int. Cl.** **G03g 15/00,** G03g 15/20
[50] **Field of Search** ..... 355/3, 10, 27, 30, 100, 106; 95/89 G, 89 D

[56] **References Cited**
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Primary Examiner—Samuel S. Matthews
Assistant Examiner—Richard L. Moses
Attorney—Waters, Roditi, Schwartz & Nissen

ABSTRACT: A drying and fixing device in an electrophotographic copying machine, in which hot air flow is used for drying and fixing, is characterized by bypassing the air flow prior to being heated, so as its to form an air curtain to shield a developing unit of the copying machine. The air curtain prevents the developing unit from being heated by the heat from the drying and fixing device, so as to prolong the life of the developing agent solution therein. The air curtain also acts to direct each developed photosensitive paper toward the drying and fixing device by preventing its folding back to the developing unit.

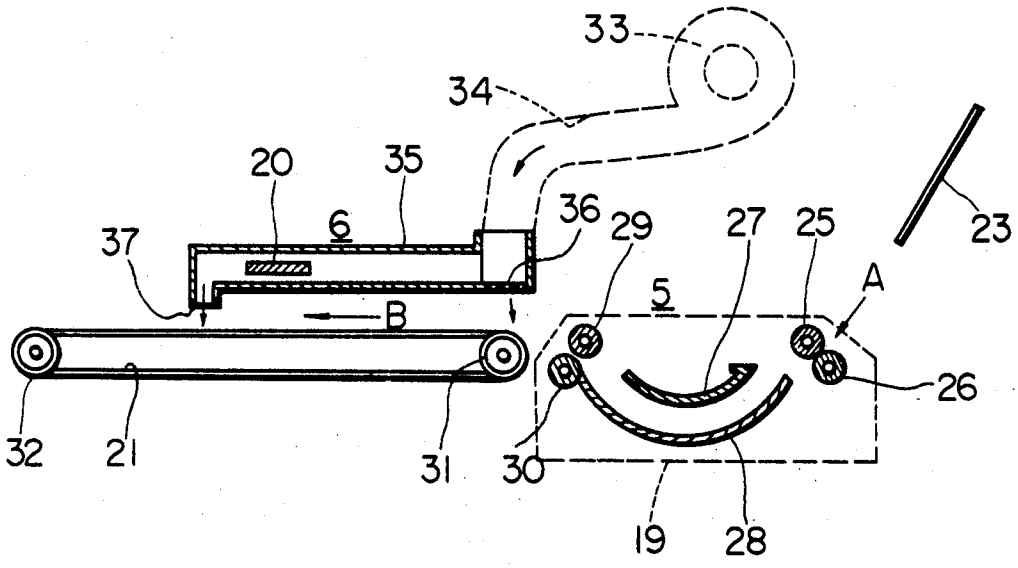


FIG. 1

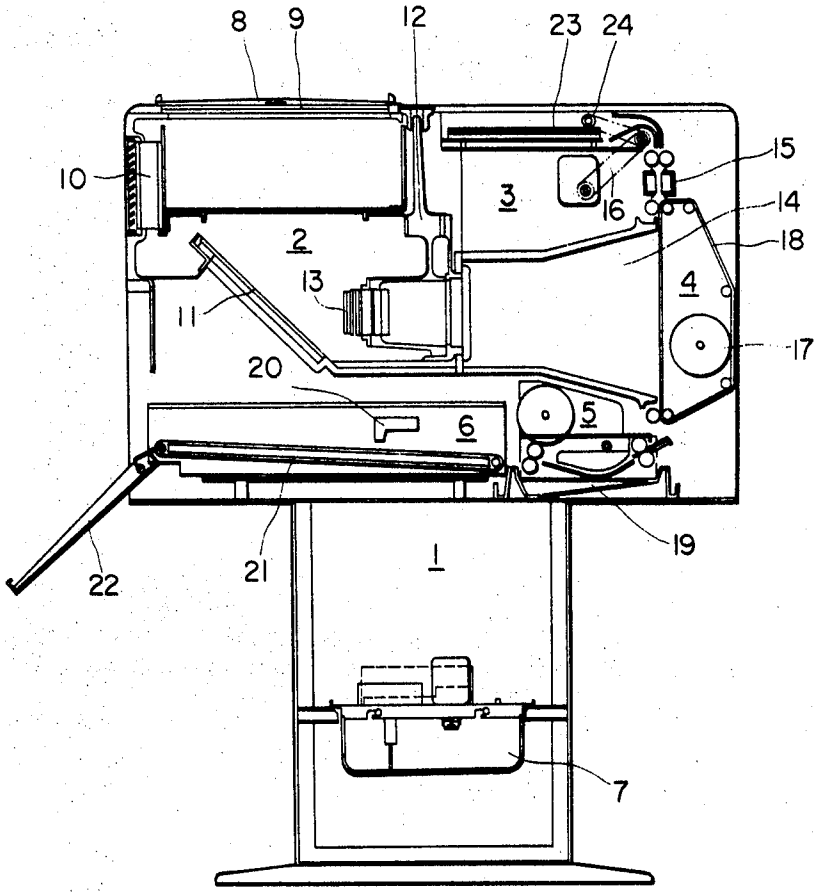
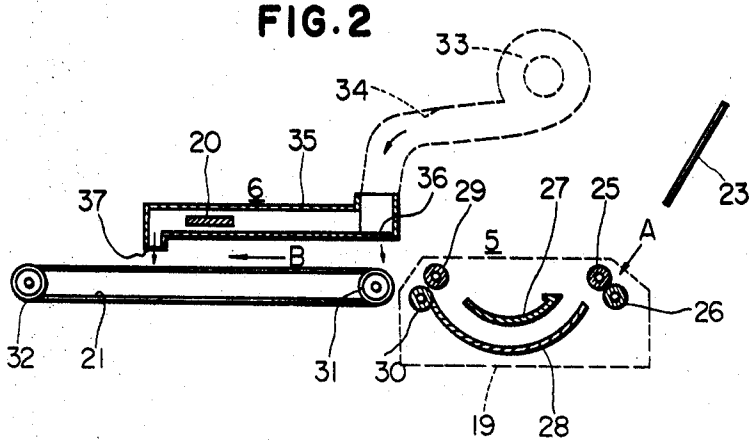

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FIG. 2


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DEVICE FOR DRYING AND FIXING IN ELECTRONIC PHOTOCOPYING MACHINE

This invention generally relates to an electrophotographic copying machine, in which a photosensitive paper, having a surface coated with a layer of zinc oxide (ZnO) powder particles or the like material, is negatively charged over said coated side, and then exposed to light for copying or photographing, and finally the thus exposed photosensitive paper is developed, dried and fixed. More particularly, this invention relates to a device for drying and fixing, in which airflow for drying and fixing the developed photosensitive paper is partially bypassed for use as an air curtain in order to shield a developing unit from heat during the drying and fixing process.

An object of the present invention is to provide a device for drying and fixing, whereby the shrinkage of the developed photosensitive paper as well as contamination of its developed image due to its accidental contact with a developing unit can be effectively avoided.

Another object of the present invention is to provide such a device for drying and fixing, which is capable of producing a developed copy with sharp contrast and allowing an increased number of repeated use or a prolonged life of a developing agent solution.

Other objects and a fuller understanding of the present invention may be had by referring to the following description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic side view of a known electrophotographic copying machine; and

FIG. 2 is a diagrammatic illustration of the device according to the present invention.

Like parts are designated by like numerals and symbols throughout the drawings.

Referring to FIG. 1, illustrating the construction of a known electrophotographic copying machine, there are designated respectively a body of the copying machine by 1, a photographing unit by 2, a paper feeding unit by 3, a main driving unit by 4, a developing unit by 5, and a drying and fixing unit by 6. All such constituent units are disposed in the upper portion of the body 1, while a developer tank 7 is mounted in the lower portion thereof, which tank holds developing agent solution for the developing unit, as shown in the figure. A glass plate 9 and a flexible rubber board 8 are mounted at the upper end of the photographing unit 2, so as to hold securely an original to be copied between the glass plate 9 and the rubber board 8. A cooling fan motor 10 is located at the front side of the photographing unit 2.

A reflecting mirror 11 is disposed at about the center of the photographing unit with such inclination that light beams from the original is deflected toward a photographing lens 13 held by a lens holder 12. A dark box 14 is integrally fabricated with the photographing lens 13. The paper feeding unit 3 is located above the dark box 14, and a paper driving mechanism 16 of the feeding unit 3 acts to feed photosensitive papers 23 to the dark box 14 through a charger 15, sheet by sheet in a known manner.

The main driving unit 4 abuts on the back of the dark box 14, and a main motor 17 of the driving unit drives an endless guide belt 18 in such manner that the guide belt moves downwards vertically along the inner back end wall of the dark box 14. The developing unit 5 is located below the dark box 14, and another motor selectively actuates a developing device 19 in the developing unit 5. The drying and fixing unit 6 is located below the photographing unit 2, and it includes a fixing heater 20 and a belt conveyor 21. A copy holder 22 extends from the drying and fixing unit 6 to the front of the photographing unit 2.

In operation of the copying machine of the aforesaid construction, upon depression of a print switch (not shown), the photosensitive papers 23, which are stacked in the dark box 14 with their sensitive surface facing downwards, are fed one by one to the charger 15 by means of a feed roller 24 of the paper feeding unit 3. After being charged, the photosensitive paper is attracted by the endless guide belt 18 of the main driving unit 4 and transferred to the dark box 14 for exposure. On the other hand, an original (not shown) placed between the glass plate 9 and the rubber board 8 is exposed to light from a suitable light source (not shown), so that the light beams from the original will be incident to the reflecting mirror 11 and reflected towards the photographing lens 13. The light beams passing through the lens 13 produces an image of the original on the aforesaid photosensitive paper, which is now brought to the inner back end wall of the dark box 14. Thus, the photosensitive paper 23 is properly exposed.

The exposed photosensitive paper 23 is then fed in to the developing device 19 by driving said actuating motor of the developing unit 5 for developing. Thereafter, the photosensitive paper 23 is transferred to the belt conveyor 21 of the drying and fixing unit 6, so as to be dried and fixed by hot airflow caused by the fixing heater 20 and a fan (not shown). Finally, the fixed sensitive paper 23 is delivered to the copy holder 22.

The aforesaid process of drying and fixing an exposed photosensitive paper by blowing hot air thereon is known by those skilled in the art and there will be no need for further discussing the details thereof. An object of the present invention is, as referred, to shield the developing unit 5 from the heat by forming an air curtain between the drying and fixing unit 6 and the developing unit 5, by bypassing a part of the airflow in the unit 6.

The drying and fixing device of the present invention which is to be mounted in said known copier will now be described in detail referring to FIG. 2. A developing device 19 includes a pair of cooperating rollers 25, 26 for feeding an exposed photosensitive paper 23 towards the space between guide vanes 27, 28, as depicted by arrow A in the FIG. The sensitive paper 23 is treated while it proceeds between the guide vanes 27, 28. A pair of squeezing rollers 29, 30 cooperate with each other to pull out the developed sensitive paper 23 out of the developing device while squeezing the excessive developing agent solution out of the sensitive paper 23. Then, the photosensitive paper 23 moves on a belt conveyor 21 in the direction of arrow B in the figure, which belt conveyor 21 is held taut between a pair of pulleys 31, 32. At the same time, the airflow delivered to a dryer 35 through air duct 34 by a blower 33 is heated by a heater 20 of the dryer 35 and directed to the developed photosensitive paper 23 through outlet openings 37 for drying and fixing.

In this particular embodiment of the present invention, a plurality of small holes 36 are bored in the dryer 35 adjacent its inlet opening to receive the air from the air duct 34 and its heater 20. The small holes 36 are preferably disposed linearly at right angles to the movement of the photosensitive paper 23, and located between the squeezing rollers 29, 30 and the pulley 31. Thus, the airflow for fixing and drying can be bypassed through the small holes 36.

With the fixing and drying unit 6 of the aforesaid construction, as shown in FIG. 2, when the developed photosensitive paper 23 is forwarded substantially vertically from the developing device 19, it is forced onto the belt conveyor 21 by the airflow bypassed through the small holes 36. Thereby, the developed photosensitive paper 23 never comes into contact with the developing device 19 after being squeezed by the rollers 29, 30, so that the risk of contaminating the image on the photosensitive paper due to such contact is completely eliminated. The bypassed airflow also prevents the clogging of the developing device 19 due to undesirable turning back of the developed photosensitive paper 23 toward the developing device. Accordingly, smooth fixing and drying operation by the hot air from the outlet openings 37 of the dryer 35 is ensured.

Furthermore, the bypassed airflow from the small holes 36 forms an air curtain between the developing device 19 and the fixing and drying unit 6, so as to prevent the developing device 19 from being heated by said heater 20 as well as by the hot air from the outlet openings 37 of the dryer 35. Thus, the tem-

perature of the developing device can be kept constant, so that sharp contrast of the copies is achieved and at the same time, the effective life of the developing agent solution in the developing device **19** is prolonged.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that various changes or modifications in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What I claim is:

1. A drying and fixing device for an electrophotographic copying machine comprising a copy paper feeding unit for feeding copy paper one by one, a main driving unit for feeding said copy paper to a predetermined exposing section, a photographing unit for airflow said copy paper, a developing unit for developing said exposed copy paper and a drying and fixing unit for drying and fixing said developed copy paper by a flow of heated air, said drying and fixing unit being disposed adjacent said developing unit and extending along a passage for copy paper delivered from the developing unit, said drying and fixing unit including a drier extending along said passage, and a blower for supplying air to said drier, said drier being hollow and having a flow passage for air from said blower, said drier including a heater arranged in the airflow passage, said drier having an opening beyond said heater for the outflow of heated air against copy paper traveling in said passage, said drier having a further opening disposed between said blower and heater and adjacent said developing unit for partial bypass of airflow from the blower against copy paper coming out of said developing unit whereby to form an air curtain for shielding said developing unit from heated air delivered to said copy paper from said drier through said outlet opening.

2. A drying and fixing device as claimed in claim **1**, wherein said further opening is constituted by a a number of small holes disposed substantially at right angles to the direction of movement of said copy paper in said passage.

3. A drying and fixing device as claimed in claim **1**, wherein said drying and fixing unit is above said passage for the copy paper.

4. A drying and fixing device as claimed in claim **3**, comprising a belt in said passage beneath the drier for receiving copy paper from the drying and fixing unit for transporting the copy paper along said passage, said further opening being positioned in the drier to blow the bypassed air against the copy paper and apply the latter on said belt.