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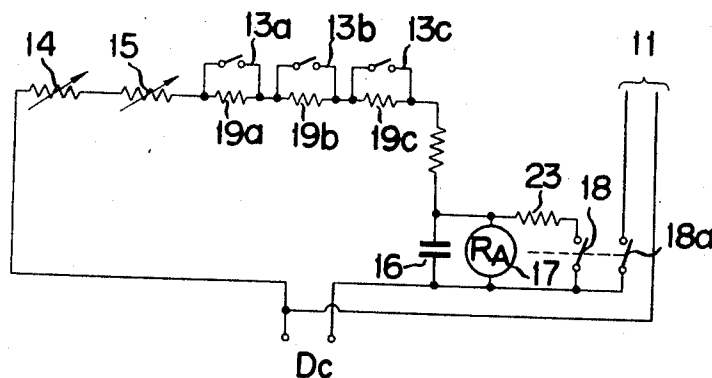
[72] Inventor **Yugoro Kobayashi**
Tokyo, Japan
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[73] Assignee **Kabushiki Kaisha Ricoh**
Tokyo, Japan
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[33] **Japan**
[31] **42/80,083**

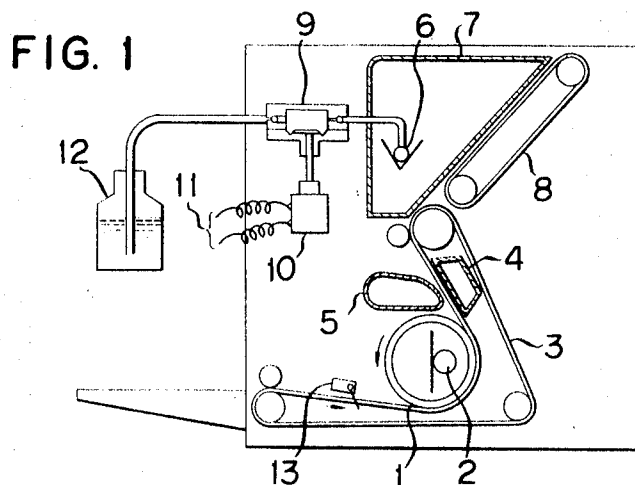
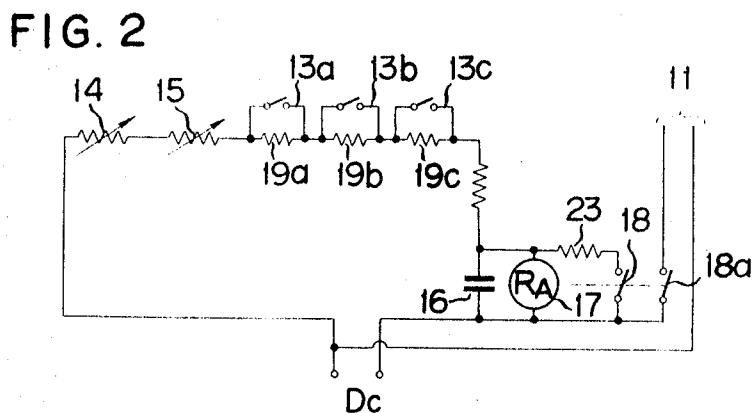
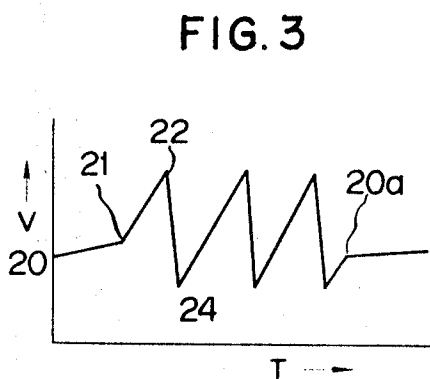
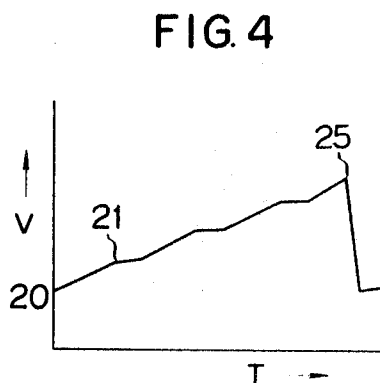
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Primary Examiner—Samuel S. Matthews
Assistant Examiner—Richard A. Wintercorn
Attorney—Burgess, Ryan and Hicks

[54] **PROCESSING DEVICE FOR USE WITH
PHOTOCOPYING MACHINE**
1 Claim, 4 Drawing Figs.

[52] U.S. Cl. 355/27,
95/13, 95/89
[51] Int. Cl. G03b 27/32
[50] Field of Search 355/27;
95/89, 13

ABSTRACT: A processing device for a photocopying machine, wherein a plurality of detecting resistors in a capacitor charging circuit detect the width as well as the length of a photosensitive paper. The charging velocity of the capacitor is controlled in response to the number of detecting resistors actuated by the photosensitive paper. The quantity of processing solution is controlled in response to the charging velocity.





INVENTOR

Yungore Kobayashi
BY Burgess, Ryan & Hicks
ATTORNEYS

PROCESSING DEVICE FOR USE WITH PHOTOCOPYING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates to a processing device for use with a photocopying machine and more particularly a processing device for use with a photocopying machine in which a processing solution is supplied and applied to the exposed surface of the photosensitive paper for developing the same.

For example, a diazo dry-type processing device in which the processing solution comprises ammonia liquid developer is evaporated in an ammonia evaporating dish so that evaporated ammonia gas is applied to the photosensitive surface of the photosensitive paper has been automated rapidly in such a manner that the quantity of ammonia to be supplied to the processing device is controlled in response to the velocity of the photocopying machine, whereby when the velocity is increased, the quantity of ammonia to be supplied is automatically increased. However, in the control system of the type described above, the quantity of ammonia supply is not correlated to the number and sizes of photosensitive papers fed into the photocopying machine. Therefore, even if no photosensitive paper is fed into the photocopying machine, ammonia is supplied in proportion to the velocity of the photocopying machine. Furthermore, even if the photosensitive papers having wider width and narrow width are intermittently fed into the photocopying machine, the same quantity of ammonia is always supplied as far as the velocity is constant. Therefore, when the quantity of ammonia supply to a cut or sheet photosensitive paper is optimum at a certain velocity, this optimum quantity will not be sufficient for processing a roll of photosensitive paper. On the other hand, the quantity of ammonia which is optimum for processing the roll of photosensitive paper will be in excess of the optimum quantity for processing the cut or sheet photosensitive paper. Furthermore, when no photosensitive paper is fed into the photocopying machine, the supplied ammonia will be completely wasted. The same is true in case of the supply of a processing solution carrying toner in electronic photography.

In view of the above, the present invention has for its object to eliminate the defects encountered in the conventional processing or developing device for use in photography, and to provide a processing device in which the quantity of a processing solution supply can be controlled in response to the area of the photosensitive paper.

SUMMARY OF THE INVENTION

According to the present invention, a plurality of detection switches are disposed transversely of the passage through which a sandwich consisting of an original to be copied and a photosensitive paper superposed one upon the other is traversed toward an exposure section. These detection switches are adapted to be actuated by the above-described sandwich. The width of the photosensitive paper can be detected by the number of detection switches actuated and the length of the photosensitive paper can be detected by the time during which said detection switches are actuated. The above switch groups are in series connected to a charging circuit comprising a capacitor and one resistor is connected in parallel to each of said switches. Therefore, when each of the switches is closed or opened, the corresponding resistor is in series circuitry with the capacitor or short-circuited so that the charging velocity of the capacitor may be controlled in response to the width and length of the photosensitive paper. When the capacitor is charged and the potential across the capacitor reaches a predetermined potential, a relay is energized so that the processing solution is supplied. On the other hand, when the potential across the capacitor drops to a predetermined potential the supply of the processing solution is stopped. Thus the quantity of the processing solution supply can be controlled in response to a number of switches actu-

ated, the time during which the switches are actuated and the inoperative time of the switches.

Other objects and advantages of the present invention will be apparent from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF DRAWINGS:

FIG. 1 is a sectional view of a processing device provided with a plurality of detection switches according to the present invention;

FIG. 2 is a schematic diagram of a control circuit of the present invention;

FIG. 3 is a graph illustrating the relation between the charging and discharge of a capacitor when a photosensitive paper having a wider width is fed; and

FIG. 4 is a graph illustrating the relation between the charging and discharge of the capacitor when a cut photosensitive paper having a narrow width is fed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, reference numeral 1 designates an exposure cylinder in which is disposed a tubular light source 2 and around which is lapped an endless belt 3. The sandwich consisting of an original to be copied which is superposed upon a photosensitive paper is held between the exposure cylinder 1 and the endless belt 3, and the photosensitive paper is exposed or printed when both of the exposure cylinder 1 and the endless belt 3 are rotated. Thereafter, the sandwich reaches suction-type separating devices 4 and 5, where the photosensitive paper is sucked by the negative pressure of the suction box 4 and traversed by means of the endless belt 3 to a processing or developing device. The original is sucked by the negative pressure of the suction box 5 and is separated from the photosensitive paper and discharged out of the photocopying machine. The photosensitive paper is further transferred to the space between a perforated wall of a processing casing 7 in which is disposed an ammonia evaporating tray or dish 6 and a conveyor belt 8. In this space, the photosensitive paper is subjected to a processing or developing by ammonia gas ejected through the perforations through the perforated wall, and thereafter is discharged out of the machine. Reference numeral 9 designates an ammonia pump for supplying liquid ammonia to the ammonia evaporating dish or tray 6. The ammonia pump 9 is actuated when a solenoid 10 is energized through lead wires 11. Reference numeral 12 designates an ammonia reservoir. A plurality of detection switches 13 are disposed in the passage of the photosensitive papers in suitably spaced-apart relation in the traverse direction of the photocopying machine, and are actuated by the photosensitive paper passing through the passage.

In the control circuit shown in FIG. 2, a variable resistor 14 coupled to the shaft of a photocopying velocity adjustment knob is connected in series to another variable resistor 15 for regulating manually the quantity of ammonia. As described with reference to FIG. 1, detecting switches 13a, 13b and 13c which are spaced apart from each other by a suitable distance along the direction of the width of the photosensitive paper are interconnected in series and further series connected to the above described variable resistors 14 and 15. Resistors 19a, 19b and 19c are connected in parallel with the detection switches 13a, 13b and 13c respectively. A capacitor 16 is connected in parallel with the above parallel circuit, and a relay coil 17 as well as a contact 18 associated with the relay coil are connected in parallel to the capacitor 16. Another contact 18a also associated with the relay coil 17 is connected to the lead 11 so as to control the solenoid 10 which in turn actuates the ammonia pump 9. Although three detection switches are shown in FIG. 2, more than three detection switches may be disposed as need demands.

The mode of operation of the above-described device and the control circuit will be described with reference to FIGS. 3

and 4. First, let it be assumed that a photosensitive paper having a wider width is inserted into the photocopying machine through an inlet thereof and all of the detection switches 13 are actuated by this photosensitive paper. Therefore, all of the detection switches 13a, 13b and 13c are closed so that their corresponding resistors 19a, 19b and 19c are short-circuited, whereby the capacitor 16 is rapidly charged. This relation is shown in FIG. 3, in which along the ordinate are plotted the potentials of the charge across the capacitor 16 while along the abscissa is plotted the time. The line between points 20 and 21 indicates the charging curve when all of the detection switches are opened while the line between points 21 and 22 indicates the charging curve when all of the detection switches are closed. When the charged potential reaches the point 22, the relay 17 is actuated so that the contacts 18 and 18a are closed. Thus, the capacitor 16 is discharged through the resistor 23, and when the potential across the capacitor 16 reaches the point 24 (See FIG. 3), the relay 17 is deenergized so that the contacts 18 and 18a are opened, whereby the capacitor 16 is charged again. When the capacitor is discharged as described above, the contact 18a is closed so that the solenoid 10 is energized whereby the ammonia pump 9 is actuated, thereby supplying ammonia from the ammonia reservoir 12 to the ammonia evaporating dish or tray 6. In this case, since the capacitor 16 is charged rapidly, the number of discharges per unit time is large so that the quantity of ammonia supply is increased accordingly. The above-described intermittent ammonia supply will be cycled until the photosensitive paper has passed through all of the detection switches 13.

When a cut or sheet photosensitive paper having a narrow width is inserted into the photocopying machine, only the detection switch 13b is actuated while the remaining detection switches 13a and 13c remain opened. In this case, only the resistor 19b is short-circuited while the remaining resistors 19a and 19c remains conductive or are not short-circuited so that the capacitor 16 is slowly charged. This is illustrated in FIG. 4. The charging characteristic curve between the points 21 and 25 has a very small gradient. Furthermore, since the cut photosensitive paper is being traversed through the machine, the charging is effected intermittently so that it takes a long time before the potential across the capacitor 16 reaches a predetermined charged potential of 25. At the potential indicated by the point 25, the relay 17 is actuated so that the contacts 18 and 18a are closed, whereby the capacitor 16 is discharged as described hereinabove. In this case, the number of discharges per unit time is less so that the quantity of ammonia to be supplied is accordingly decreased.

The cases where all of the detection switches are actuated or only one detection switch is actuated have been described hereinabove. But depending upon the size of the photosensitive paper, two detection switches may be necessarily actuated. In this case, it will be readily understood that the charg-

ing characteristic curve will have a gradient which is steeper than that of FIG. 4 but less steep than that of FIG. 3. When more than three detection switches are disposed, it will be seen that various gradients will be obtained.

As described in detail hereinabove, according to the present invention, the quantity of ammonia supply is dependent upon the width and length, that is upon the area of the photosensitive paper so that the defects encountered in the conventional dry-type processing or developing devices can be eliminated. When no photosensitive paper is fed into the photocopying machine, all of the resistors 19a, 19b and 19c are not short-circuited so that the charging characteristic curve rises gradually along the line between points 20 and 21, whereby only a small quantity of ammonia is supplied as "maintenance ammonia." Thus, according to the present invention, the processing or developing device is automatically supplied at all times with a required amount of ammonia so that the consumption of ammonia is decreased and the photocopying operation is facilitated with high efficiency even by "an amateur" operator since no manual adjustment of the supply of ammonia is required.

Although the detection switches 13 have been shown as being disposed ahead of the exposure cylinder as shown in FIG. 1, they may be disposed at any position in the photosensitive paper passage of the photocopying machine.

The present invention has been described in detail with particular reference to the diazo dry processing or developing method utilizing ammonia gas, but the present invention is not limited thereto. It will be understood that the present invention can be applied to a case in which a processing solution containing toner or any other processing solution is supplied in an electric photography.

I claim:

1. A processing device for use with a photocopying machine comprising:
 - means for detecting the width as well as the length of a photosensitive paper transported through the machine;
 - means operatively connected to said detecting means for controlling the quantity of a processing solution in response to the size of the paper;
 - said detecting means comprising a plurality of detection switches which are spaced apart from each other by a suitable distance in the direction of the width of the photosensitive paper and which are connected in series with each other;
 - resistor means connected in parallel with each of said detection switches;
 - said control means comprising a capacitor operatively connected for charging through said detecting means;
 - means for controlling the discharge of said capacitor; and
 - means for actuating a processing solution supply pump in response to the discharge of said capacitor.

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