

United States Patent

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[54] **FLOW-TYPE PHOTOELECTRIC DUPLICATING MACHINE HAVING MEANS FOR CHANGING THE CORONA VOLTAGE IN ACCORDANCE WITH THE PAPER SPEED**
 1 Claim, 3 Drawing Figs.

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 [51] Int. Cl. G03g 13/00
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 317/262; 355/3

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ABSTRACT: In a flow-type photoelectric duplicating machine in which the original to be duplicated and the photosensitive paper are positioned in such a way as to be optically interrelated and connected by the optically connecting optical system, for which purpose the original that is illuminated by the illuminating device is gradually sent from one end to the other across the light path of the said optical system, while synchronously the photosensitive paper is sent, after having been gradually sent from one end to the other through the electrostatic charging device, across the light path of the said optical system, so that the image of the original is gradually duplicated from one end to the other on the photosensitive paper; in such a flow-type photoelectric duplicating machine, an electric and/or mechanical connection is established between the passage speed of the photosensitive paper and the terminal voltage of the electrostatic charging device so that the one increases when the other increases and the one decreases when the other decreases.

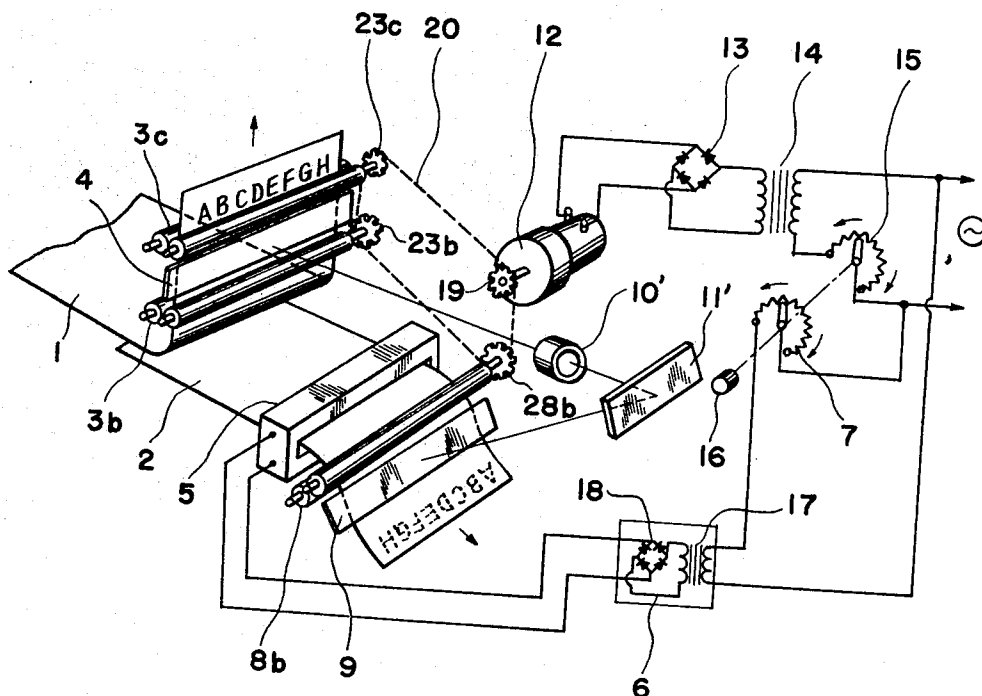
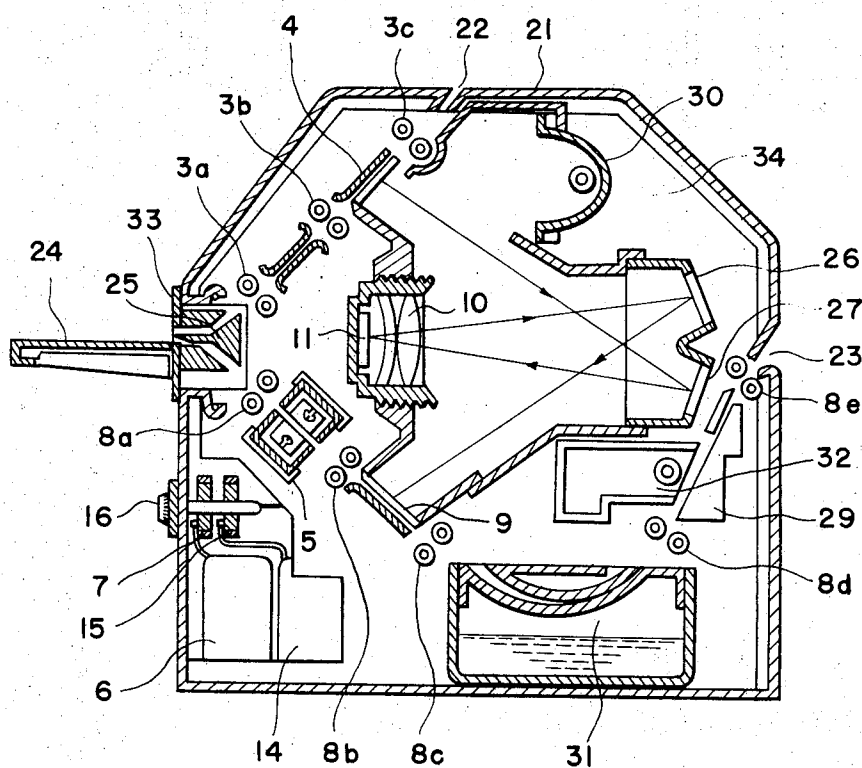


FIG. 2



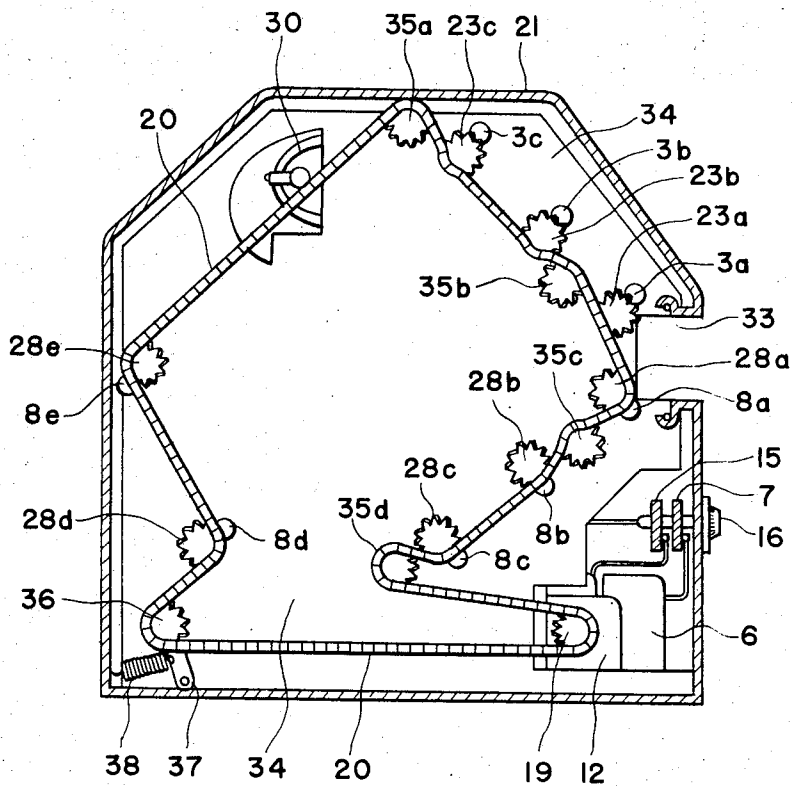
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FIG. 3



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FLOW-TYPE PHOTOELECTRIC DUPLICATING MACHINE HAVING MEANS FOR CHANGING THE CORONA VOLTAGE IN ACCORDANCE WITH THE PAPER SPEED

BACKGROUND OF THE INVENTION

In a duplicating machine for feeding photosensitive paper and an original in a flow-type, well known in the prior art, there is the defect that nothing is provided for easily changing the impressed voltage for the charging device in accordance with the passage speed of said photosensitive paper, and therefore even though photosensitive paper with a higher photosensitivity is used it is impossible to promote easily an efficiency in duplication.

SUMMARY OF THE INVENTION

The object of the present invention is to provide, in a photoelectric duplicating machine for feeding the photosensitive paper and an original at the same time, a simple device for promoting the duplication efficiency in accordance with the photosensitivity of said photosensitive paper and fixing the electrostatic charges given by the electrostatic charging device.

Another object of the present invention is to enable the adjustment of the resistance values of two variable resistances for maintaining the impressed voltage for the driving motor for the carrying mechanism and the impressed voltage for the electrostatic charging device in a fixed relationship by means of one knob, in order to change the impressed voltage for said electrostatic charging device in conformity with the passage speed in accordance with the photosensitivity of the photosensitive paper.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective showing the outline of the fundamental construction of the present invention.

FIG. 2 is a right side vertical section of a preferred embodiment of the present invention.

FIG. 3 is a left side view of the same preferred embodiment without the left side plate.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a perspective showing the outline of the fundamental construction of the present invention. In this flow-type photoelectric duplicating machine, the original 1 is sent by the original carrying rollers 3b and 3c in the direction of the arrow so that it passes across the exposure window 4 which consists of a transparent glass plate, while the photosensitive paper 2 is sent by the photosensitive paper carrying roller 8b in the direction of the arrow so that it passes, after passing through the electrostatic charging device 5, across the image-forming window 9 which consists of a transparent glass plate. The duplication lens 10' focuses into an image the original that is gradually passing across the exposure window 4 and the image is reflexed by the mirror 11' onto the image-forming window 9 and thus the electrostatic latent image of the original 1 is formed on the charged photosensitive paper 2.

The original carrying rollers 3b and 3c and the photosensitive paper carrying roller 8b are driven synchronously by the chain 20 that strings and connects the driving gear 19 of the motor 12 with the gears 23b, 23c and 28b which are fixed on the axles of the carrying rollers 3b, 3c and 8b respectively. The motor 12 is driven by the electric current supplied through the secondary coil of the first transformer 14 and rectified by the rectifier 13. The variable first resistance 15 is connected in series with the primary coil of the transformer 14 which is connected with the power supply.

In parallel with the said primary coil is connected the high direct voltage generating device 6 comprising the second transformer 17 and the rectification circuit 18 for the charging device 5, and the second variable resistance 7, which is connected in series with the input circuit of the high direct voltage

generating device 6, is related with the said first variable resistance 15 for the motor so that when the voltage of the motor power supply is increased by turning the dial 16, the terminal voltage of the charging device 5 is also increased.

When some photosensitive paper with a higher photosensitivity is used, the dial 16 is to be turned towards the left; then the resistance value of the variable resistance 15 and that of the variable resistance 7 are both decreased and the rotation speed of the motor 12 is increased so that the passage speed of the original and the photosensitive paper is increased, and simultaneously the terminal voltage of the charging device 5 is equally increased, so that the proper relation is maintained between the said terminal voltage and the said passage speed.

FIG. 2 and FIG. 3 show a preferred embodiment of the flow-type photoelectric duplicating machine with the fundamental construction shown in FIG. 1 and the star-shaped light path. FIG. 2 is the right side vertical section and FIG. 3 is the left side view without the side plate.

The outer casing 21 consists of the covering that covers round (the front and back and top and bottom of) the duplicating machine and of the right and left side plates. The feeding table 24 with the separating plate 25 is detachably fitted into the opening 33 in the front of the outer casing. FIG. 2 shows the outer casing with the feeding table 24, and FIG. 3 shows the outer casing without the feeding table 24.

On this feeding table the original is put on top of the photosensitive paper, the two facing each other, and the original is inserted over the separating plate 25 and the photosensitive paper under the separating plate 25. The original, after being separated from the photosensitive paper by the separating plate 25, is sent diagonally upwards inside the machine frame by the original carrying rollers 3a, 3b and 3c, and, after passing across the exposure window 4, comes out of the original outlet 22. The device 30 is the illuminating device that illuminates the original as it passes across the exposure window 4. On the other hand, the photosensitive paper, after being separated from the original by the separating plate 25, is sent backwards, by the photosensitive paper rollers 8a, 8b, 8c, 8d and 8e, in a catenary passage inside the machine frame, and comes out of the outlet 23 after passing through the charging device 5, the image-forming window 9, the developing tub 31 and the drying part 32. The charging device 5 has the terminals which are arranged at a right angle to the direction in which the photosensitive paper passes and in parallel with and approximately 2 centimeters away from the photosensitive paper, and the said terminals are mounted on the corona shield frame. The terminals are connected with the output side of the high voltage generating device 6 that supplies high direct voltage. As the photosensitive paper passes through the charging device 5 it is uniformly charged in proportion to the passage speed and the terminal voltage.

As the original, carried by the original carrying rollers 3a, 3b and 3c, gradually passes across the exposure window 4 being illuminated by the illuminating device 30, the light from the original is reflected by the first mirror 27 onto the mirror-lens system which consists of the lens 10 and the mirror 11, from which the light, reflected by the second mirror 26, focuses into an image on the uniformly charged photosensitive paper which is gradually passing across the image-forming window 9, and an electrostatic latent image that corresponds to the original is formed on the photosensitive paper. This photosensitive paper with the latent image is developed in the developing tub 31 where the toner sticks to the photosensitive paper in accordance with the residual charge on it, and, after being dried in the drying part 32, comes out. The device 29 is the guiding plate that guides the wet photosensitive paper.

The axles of the original carrying rollers 3a, 3b, 3c and the photosensitive paper carrying rollers 8a, 8b, 8c, 8d, 8e are rotatably supported by the side frame plate 34 of the machine frame, and, as is shown by FIG. 3, the gears 23a, 23b, 23c and 28a, 28b, 28c, 28d, 28e are fixed on the left ends of the axles of those rollers between the side frame plate 34 and the side plate of the outer casing. The chain 20 strings and connects

the said gears and the driving gear 19 of the motor 12, and the said chain 20 also strings and connects the gears 35a, 35b, 35c and 35d which change the direction of the chain and also prevent it from coming off the neighboring gears and whose axles are supported by the side frame plate 34, and the tension gear 36 whose axle is supported by the lever 37 of which one end is pivoted on the machine frame and the other is pulled by the spring 38. And with the rotation of the motor 12 all these gears rotate simultaneously and the carrying rollers revolve and carry the original and the photosensitive paper at the same speed.

The high voltage generating device for the charging device 5 consists of the transformer 17 and the rectification circuit 18 (See FIG. 1) and is connected with the power supply. And the variable resistance 7 is connected in series with the input circuit of the said high voltage generating device, and the resistance value of the variable resistance 7 can be increased or decreased by turning the dial 16 which is mounted on the front of the outer casing 21. And the variable resistance 15, which is connected in series with the primary coil of the transformer 14 for the motor 12, is connected on the same axle as that of the dial 16 for the said variable resistance 7, so that by turning the dial 16 the resistance value of the variable resistance 15 can be increased or decreased equally with that of the variable resistance 7.

Thus, by adjusting the dial 16 according to the photosensitivity of the photosensitive paper, the passage speed of the photosensitive paper and the original can be changed together with the terminal voltage of the charging device 5, and thus the photosensitive paper can be charged properly by the charging device 5 whatever its passage speed may be, and duplication efficiency can be improved.

In the preferred embodiment described above, there are separate variable resistances 7 and 15, but they can be replaced by one variable resistance which controls both the transformer for the motor and the high direct voltage generating device.

I claim:

1. A flow-type photoelectric duplicating machine comprising a feeding table, a separating plate for separating the original and the photosensitive paper fed in one upon another from said feeding table and feeding them to the original carrying mechanism and the photosensitive paper carrying mechanism, a driving motor for driving said original carrying mechanism and said photosensitive paper carrying mechanism, a first transformer for supplying the electric power to said driving motor, a first variable resistance connected in series to the primary winding on the power side of said first transformer, a charging device for charging said photosensitive paper, a second transformer for supplying the high voltage to said charging device, a second variable resistance connected in series to the primary winding on the power side of said second transformer, and means for simultaneously and correspondingly changing the resistance values of both said first and second variable resistances so that the carrying speed of both said carrying mechanisms driven by the driving motor is changed in accordance with the photosensitivity of the photosensitive paper and at the same time the impressed voltage for said charging device is adjusted so as to fix the charging quantity to the photosensitive paper, which is given by said charging device, corresponding to the change in speed.

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