

United States Patent

[11] 3,591,286

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 [33] **Japan**
 [31] **10195/67**

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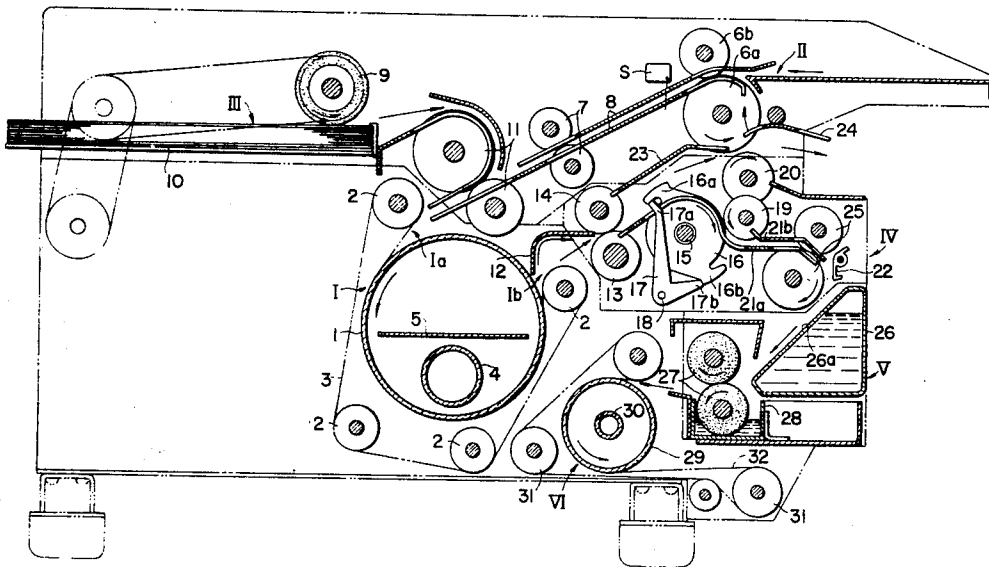
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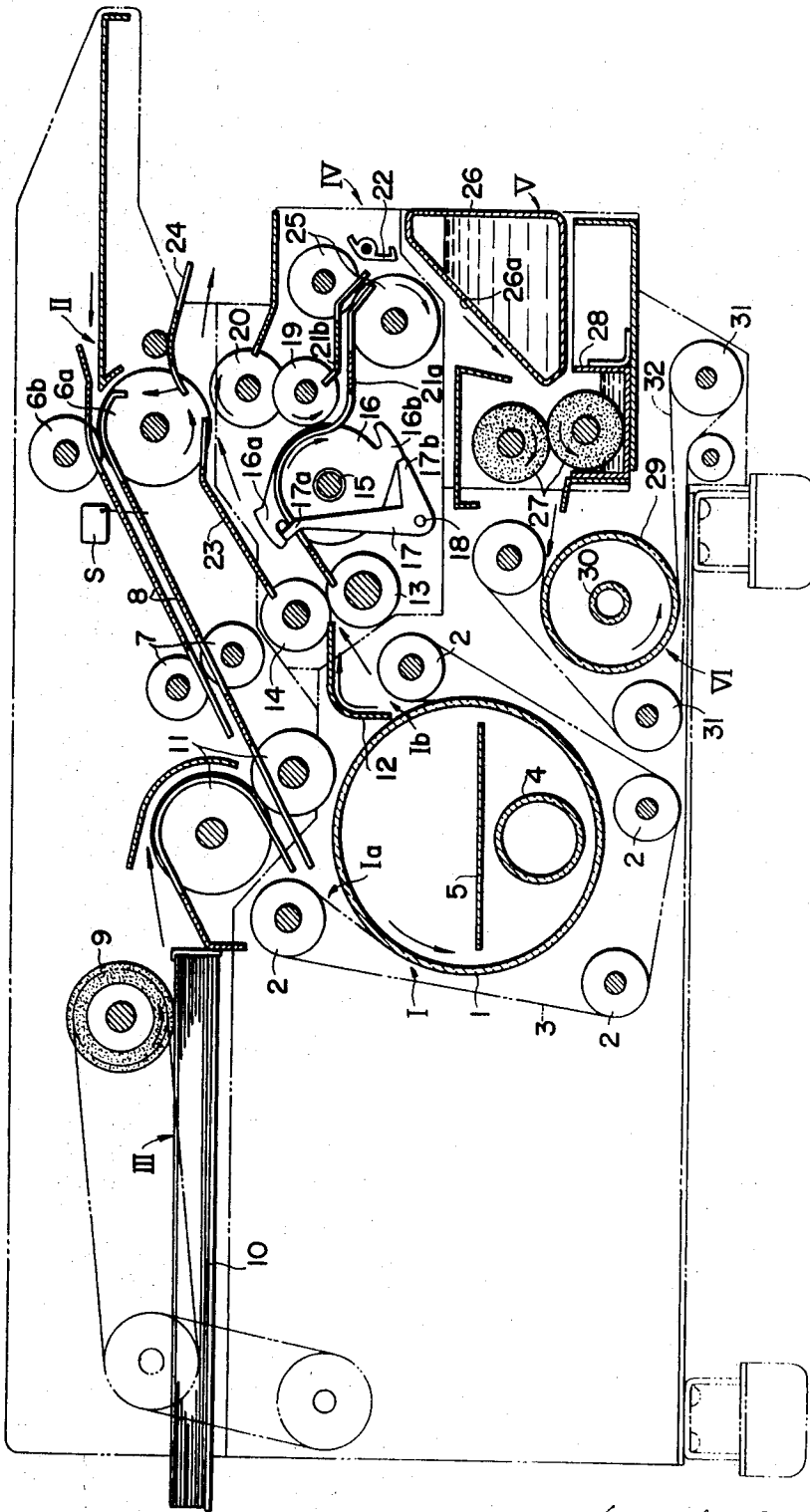
[54] **PHOTOGRAPHIC COPYING MACHINE**
1 Claim, 1 Drawing Fig.

[52] U.S. Cl..... **355/106,**
355/10, 95/94
 [51] Int. Cl..... **G03b 27/30**
 [50] Field of Search..... **355/106, 3,**
14, 104, 107, 10; 95/89, 94, 96

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ABSTRACT: An original document if fed rearwardly into an inlet slot near the top of a copying machine, where it is lapped with a printing paper sheet fed toward the front of the machine from a stock, and the lapped papers are fed downwardly, around an exposure drum centrally located in the machine, and upwardly into a separator, from which the original emerges in the front of the machine below the inlet slot. The printing paper sheet is fed downward and rearward through a developing section, when it passes around a drying roller and is fed forward out of the machine at the bottom of the front face thereof.





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PHOTOGRAPHIC COPYING MACHINE

BACKGROUND OF THE INVENTION

Photographic copying machines that employ a diazo type of sensitive paper may be made in relatively compact desk top embodiments. They must have a reservoir for developing fluid. The travel paths for the original document and copies thereof should be compact and should not interfere with the actions of the operator in loading the machine.

The various structures known are subject, in some cases, to the disadvantage of having the copy or the original feed out of the machine at such a position as to block the view of the operator who is attempting to feed a second original into the machine. In addition, the known machines have hidden reservoirs which given no warning as they run dry, or which require a warning light or other auxiliary mechanism to notify the operator of a low fluid level.

SUMMARY OF THE INVENTION

The invention relates to an economical, effective, and compact arrangement of various components of diazo-type photocopying machine, including the provision of a transparent liquid reservoir visible from the operator's position. A receiving entrance for the original document is provided at the top front portion of the machine, from which the document is conducted by rollers and guides backward to the center of the machine. Simultaneously a sheet of copy paper is fed from a stock at the rear of the machine toward the front, meeting and being lapped with the original document at the center of the machine. The lapped documents are fed downward and passed around a transparent exposure drum by a belt, which reverses their direction and feeds them forwardly and upwardly to a separator. Here the original is separated and ejected from the front of the machine beneath the receiving entrance. It thus does not fall over or obscure the receiving entrance, so avoiding any interference with the feeding of a following document.

The separated copy sheet is fed downward from the separator in a path near the front of the machine. From there it passes rearwardly through moistening rollers which apply a developing liquid and over a drying roll, which dries it and reverses its course so that is finally transmitted forwardly and out of the machine at the bottom front thereof.

Inset into the front of the machine is a transparent developing fluid reservoir which is both adjacent to the moistening rolls and visible to the operator, who can thus monitor the fluid level.

This invention will be described with reference to the drawing, which illustrates one embodiment thereof. The drawing shows a photographic copying machine using diazo-type sensitive papers (designate printing paper hereinafter). The well-known transparent cylinder 1 is provided near the central portion of the body of the photographic copying machine, said transparent cylinder being supported rotatably within the loop of the endless transporting belt 3 which is looped around the outside of the four rollers 2. Within said transparent cylinder 1 a lighting tube lamp 4 and a reflecting plate 5 are provided on the stationary element of said body, and these parts comprise an exposing device I of the photographic copying machine. On the upper position of said exposing device, original drawing paper-feeding device II is comprised of two sets of rollers 6a and 6b and 7 to guide an original paper to said exposure device I after the insertion of the original drawing paper between the guide plates 8. Paper-feeding device III feeds the printing paper stocked on the printing paper mounting board 10 by means of the roller 9 which rotates in response to the feeding of the original paper.

At the position where the original paper and the printing paper are lapped, one pair of rotating feeding rollers 11 are provided, said feeding rollers feeding the lapped original paper and the printing paper to the entrance port 1a of exposure device I.

Above the discharge port 1b of the exposure device I, a guide plate 12 is provided which is bent at a right angle and said guide plate guides both the lapped original paper and the printing paper between a pair of rollers 13 and 14 having different peripheral speeds.

Since said roller 13 rotates at a higher peripheral speed than the roller 14 (which is positioned to contact the top of said roller 13) leading edge of the printing paper will be advanced slightly ahead of that of the original paper.

In front of said pair of rollers 13 and 14, and aligned with the opening between them, is separating plate 16 having a pair of bill shaped pawls on opposed positions of the periphery. The separating plate is rotatably mounted on the supporting spindle 15. The separating plate is easily able to rotate on the spindle. The bellcrank lever 17 which is pivoted below said separating plate 16 is rotatably biased to the left on the supporting spindle 18 by a spring or weight (not shown in the drawing). One arm 17a of said lever is extended to the pawl 16a of said separating plate 16, and the other arm 17b of said lever is engaged with the shoulder of the other pawl 16b of said separating plate 16, and thereby prevents rotation of said separating plate. When arm 17a is pushed by the top edge of the printing paper, the lever 17 rotates clockwise on the spindle 18, and at the same time releases the separating plate 16 by disengaging the other lever 17b so that the separating plate rotates on the supporting spindle 15.

Ahead of said separating plate 16, rollers 19 and 20 having different rotating directions are pivoted, and beyond the outer peripheral edge of said separating plate 16 a passage is formed by curved guide plate 21a, (one side of which is provided slightly inside the periphery of said separating plate) and an auxiliary guide plate 21b. Therefore, one roller 19 feeds the printing paper along the guide plates 21a, 21b and 22, while the other roller 20 discharges the original drawing paper to the outside of the machine.

When said lapped two sheets of paper enter between the rollers 13 and 14, the leading edge of the printing paper is advanced slightly more than that of the original drawing paper by the roller 13 which rotates at a higher peripheral speed than roller 14. As the leading edge of the printing paper pushes arm 17a of the lever 17 said lever is turned clockwise on the spindle 18, thus releasing arm 17b from and the separating plate 16. The leading edge of the printing paper is transmitted around the supporting spindle 15 along the guide plate 21a, 21b while engaged with the pawl 16a of said separating plate 16, and is further transmitted to the developing device by the rollers 25. On the other hand, the leading edge of the original paper which is transmitted slightly behind the leading edge of the printing paper is transmitted forwardly sliding along the outside periphery of the circular arc of the separating plate without engaging with the pawl of said separating plate 16.

Further, the original paper is discharged to the outside of the machine, transmitted by rotating roller 20 in the direction shown in the arrow.

Guide plate 24 is curved to followed the peripheral surface of said roller 6a, and the original drawing paper can be introduced into the passage 8 of the paper feeding device again by turning said guide plate on the supporting spindle about 90° clockwise from the position shown in the drawing so that great numbers of copies can be obtained from one sheet of the original paper.

In the advancing direction of said printing paper, one pair of transmitting rollers 25 are provided on the side plate, and these parts from said rollers 13 and 14 to said transmitting roller 25 an automatic separating device IV.

In this connection for said automatic separating device there may be substituted an automatic separating device based upon the well-known vacuum system or an automatic separating device constructed from one pair of rollers having same rotating direction, and or any other device.

Transparent developing liquid reservoir 26 of triangular cross section is provided under said transmitting roller 25, and the inclined surface 26a of said reservoir serves as a guide

plate; and the printing paper fed is fed thereby to the developing process of mentioned below.

As the transparent reservoir 26 is constructed of a transparent material, the operator is able to see the contents thereof from the front of the machine. One pair of developing liquid applying rollers 27 is provided on the machine frame on the back of reservoir 26, the undermost part of the roller of one of said applying roller being submerged in the developing liquid of the developing reservoir 28, and thus the developing device V is constructed of these above mentioned parts.

The drying device VI is located between said developing device V and said exposure device, and said drying device is comprised of the heat-producing tube body 30 located in the heating cylinder 29 and the endless belt 32 connected to the outside peripheral surface of a number of rollers 31. Said endless belt 32 transmits the dry printing paper to the front surface of the under portion of the photographic copying machine. Therefore, the printing paper transmitted from the pair of developing rollers 27 is discharged to the outside of the machine after being passed between said heating cylinder 29 and the endless belt 32.

Now, when the operator feeds the original paper to the original drawing paper feeding device II, said original paper is positively transmitted compulsorily through the guide rollers 6a and 6b.

Then, when the top edge of the original drawing paper strikes the contact lever of the switch S, the roller 9 of the paper feeding device III is rotated by the driving clutch mechanism as a result of the turning on electric current to the electromagnet which is not shown in the drawing, and draws out one sheet of the printing paper in the direction shown in arrow, and after lapping the original paper and the printing paper feeds it to the exposure device I through the feed roller II.

Both papers are transmitted between the outside surface of the transparent cylinder 1 and the endless transmitting belt 3 and after the latent image is formed on the printing paper through the action of the light of the lighting tube lamp 4 are discharged along the guide plate 12 from the discharge port 1b of the exposure device I.

Then, when said lapped papers are passed through said rollers 13, 14, said lapped papers are separated individually by the automatic separating device IV, and the printing paper is fed along the guide plate 21a and 21b, and transmitted to the developing device V through the roller 25.

The original drawing paper is discharged to the outside of the device through the roller 20. The printing paper is fed out between one pair of applying rollers 27 and slides down the slope of said reservoir 26, and here developing is conducted, and then discharged to the outside of the machine after passing between the heating cylinder 29 of the drying device VI and the endless belt 32.

Further, in the automatic separating device, when the lapped papers are transmitted under nonseparated condition due to any cause, they may be discharged promptly by operating the guide plate 22 from the outside of the machine. As described above, the photographic copying machine based on this invention, the feeding device for the original drawing paper and the paper feeding device for the printing paper are provided on the upper portion of the body, and the exposure device and the separating device are equipped on the central portion of the body, further, as the developing and the drying device are provided on the lower position of the body successively, the original paper is discharged to the lower front surface of the body automatically dried state after being developed.

Therefore, this invention does not obstruct the manipulation of the originals as did the former photographic copying

machine of this kind which had a supporting rack for the original paper to be discharged just above the feeding table of the next sheet of original paper, and it is easy to operate for human engineering, and the photographic copying machine can be assembled in a compact size.

Moreover, as the developing reservoir and the developing device are provided on the lower position of the front of the body, operator can observe the quantity of the developing liquid during the operation of the machine.

If the developing liquid is allowed to leak by carelessness, it does not spoil the other parts of the machine, and furthermore, as the dry copying paper is discharged in the front of the machine, it can be inspected for exact exposure of non exact exposure promptly, so the operation may be conducted continuously and this invention model is extremely practical.

I claim:

1. A photocopying machine having a front area, a rear area, a top portion and a bottom portion and comprising:

guide means at the front area in the top portion for feeding an original document to a central part of the machine;

storage means for a supply of copy sheets located at the rear area in the top portion and feed means associated with said storage means to feed a copy sheet to an area in said central part to overlap with the original document;

a transparent exposure drum having a tight source there in located in the bottom portion of the central part of the machine directly below said overlapping area;

means for carrying said overlapped original document and copy sheet downwardly around the periphery of said exposure drum and then upwardly to a central area of the machine at a higher level than any part of said exposure drum;

separator means located in the front area at said higher level central area, said separator means comprising a pair of rollers rotating at different speeds so that the overlapped original document and copy sheet passing therebetween are slightly separated to allow the copy sheet to advance faster and contact a pivotal lever and be directed downwardly while said original document follows along to be directed further upwardly to a higher level than any part of said exposure drum to exit from the front area of the machine below said feed guide means;

further guide means located in the front area adjacent said separator means for receiving the copy sheet from the separator means to direct said sheet downwardly along said front area;

a developing fluid reservoir located in the front area directly below said further guide means and spaced substantially horizontally from said exposure drum, said fluid reservoir being transparent and visible to an operator, from the front of the machine, said fluid reservoir having a triangular shape with one side extending vertically along the front of the machine and another side inclined downwardly from the top of the reservoir toward the center of the machine, said inclined side forming a guide plate for said copy sheet passing from said separator means;

developing means located directly below said separator means and substantially on a horizontal level with said exposure drum, said developing means comprising a pair of vertically positioned rolls, one of which is rotatably mounted in a developing fluid tank that is located on a level lower than the location of said fluid reservoir; and

a rotatable drying device located in the bottom portion of the machine below the central overlapping area and comprising a heating cylinder around which the copy sheet passes to exit from the front area of the machine at the bottom portion.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,591,286 Dated July 6, 1971

Inventor(s) Nobuyuki Yanagawa

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

- Page 1, correct spelling of "Kabushiki Kaisha Ricoh";
- Abstract, line 1, change "if" to -- is --;
- Column 2, line 8, insert -- the -- before "leading";
- Column 2, line 40, change "that" to -- than --;
- Column 3, line 29, after "on" insert -- of an --.
- Column 4, line 13, change "of" to -- or --;
- Column 4, line 15, delete "model";
- Column 4, line 25, change "tight" to -- light -- and change "there in" to -- therein --;
- Column 4, line 50, delete the comma.

Signed and sealed this 11th day of April 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents