

[54] **DEVICE FOR CORRECTING THE MISALIGNMENT OF THE ORIGINAL COPY AND COPYING PAPER OF A DUPLICATOR**

[75] Inventor: **Satoshi Kanda**, Yokohama, Japan

[73] Assignee: **Kabushiki Kaisha Ricoh**, Tokyo, Japan

[22] Filed: **Jan. 30, 1970**

[\*] Notice: The portion of the term of the patent subsequent to May 18, 1990 has been disclaimed.

[21] Appl. No.: **7,199**

[30] **Foreign Application Priority Data**

Feb. 1, 1969 Japan..... 44-7477

[52] U.S. Cl..... 271/9, 271/57, 271/60

[51] Int. Cl..... B65h 5/06

[58] Field of Search..... 271/57, 9, 60; 270/58

[56] **References Cited**

**UNITED STATES PATENTS**

3,279,787 10/1966 Niccoli..... 271/57 X

3,475,093 10/1969 Mazzio et al. .... 271/8 X

Primary Examiner—Evon C. Blunk

Assistant Examiner—Bruce H. Stoner, Jr.

[57] **ABSTRACT**

A feed system for a duplicator for the feeding of original and copying paper. A DC motor is provided for feeding the original and detecting means are provided for detecting the passage of the leading and trailing edges of the original past a given point. A feeding roller for the copying paper is also coupled to the DC motor. A pivoted member has a roller on one end opposed to the feed roller, and a roller on the other end opposed to a compensating roller for adjusting the position of a copying paper. The pivoted member is actuated by detection of the leading edge of the original past the point to move in a direction to effect the feeding of the copying paper by the feed roller. Upon detection of the trailing edge of the original, the pivoted member is moved to enable adjustment of position of a copying paper by the compensating roller. The compensating roller is driven by a DC balancing motor, the balancing motor being driven by a voltage corresponding to the difference between the armature voltage of the DC drive motor and the voltage at a tap of a potentiometer. The position of the tap is controlled by the balancing motor, so that the balancing motor only operates when the voltage at the tap is different than the voltage at the armature of the DC drive motor.

2 Claims, 2 Drawing Figures

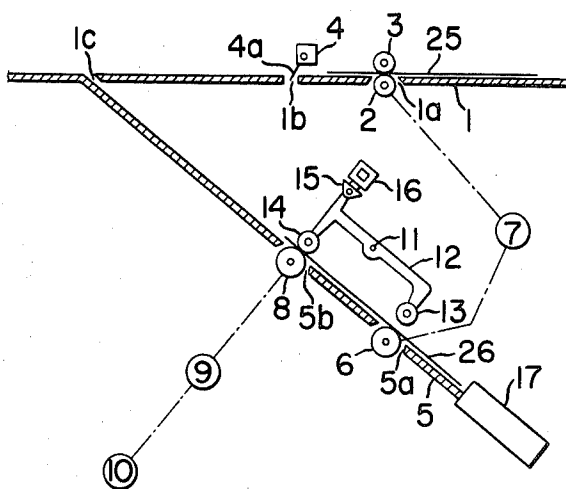


FIG. 1

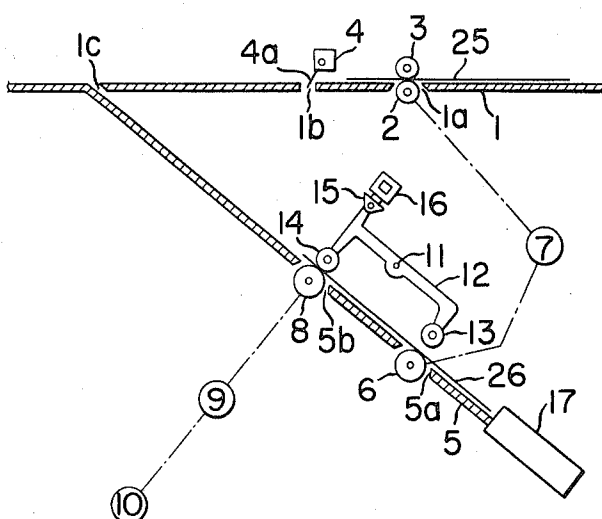
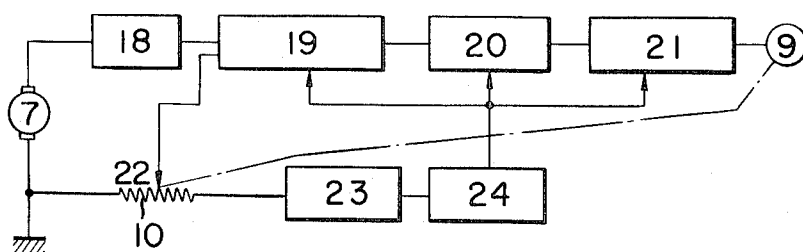


FIG. 2



# DEVICE FOR CORRECTING THE MISALIGNMENT OF THE ORIGINAL COPY AND COPYING PAPER OF A DUPLICATOR

## BACKGROUND OF THE INVENTION

The present invention relates to a duplicator, and more in particular the present invention relates to the device for correcting the misalignment of the original copy and the copying paper in a duplicator wherein the copying paper is laid on the original copy and is exposed.

In a duplicator wherein copying paper is automatically supplied, when the front end of the original copy is detected to pass a predetermined position, copying paper is automatically supplied, and then the next copying paper is set at a predetermined position, and thereafter the same operation is repeated.

In the above mentioned case, a time lag from the time when the passage of the front end of the original copy is detected to the time when the feeding of copying paper is started, and a time lag exists from the time when the passage of the rear end of the original copy is detected to the time when the setting of copying paper is terminated, and the shear or misalignment of the original copy and the copying paper is brought about.

Therefore, in order to prevent the increase of the misalignment during the repetition of copying operation, the two time lags are made to be equal.

Further, in order to prevent the misalignment between the original copy and the copying paper, the copying paper must be set in advance by the length equal to the predicted misalignment.

In addition, the above mentioned misalignment is increased as the travelling speed of the original copy and the copying paper is increased.

Therefore, the position where the copying papers are set, must be changed in accordance with the copying speed.

The present invention has been attained with a view to satisfying the above mentioned demand.

Thus, one of the objects of the present invention is to provide a device for automatically adjusting the position of copying papers in accordance with the copying speed in such a manner that the misalignment of the original copy and the copying papers should not be brought about.

Another object of the present invention is to economically provide a device whose structure is simple for correcting the misalignment of the original copy and the copying paper.

## SUMMARY OF THE INVENTION

Generally speaking, when the circuit resistance of the armature of an electric motor is set to be  $R$ , and current is set to be  $I$ , and the effective magnetic flux per magnetic pole is set to be  $\Phi$ , there is the relation represented by the general formula given below between the number of revolutions ( $n$ ) of the electric motor and the voltage of the armature  $E_a$ ;

$$n = E_a - IR/K \Phi$$

(wherein  $K$  is constant)

Therefore, in the above mentioned duplicator, when the travelling speed of the original copy and copying paper in changed, the voltage of armature is also changed.

In accordance with the present invention, the position where the copying paper is set by the rollers interlocked to the DC balancing motor is provided by driving the balance DC electric motor by the differential voltage between the armature voltage of the electric motor for driving the respective rollers for carrying the original copy and the copying papers, and the voltage of the slide contact of the potentiometer to which the constant voltage is supplied. The position is corrected in accordance with the copying speed.

The magnitude and the polarity of the above mentioned differential voltage are detected by a phase sensitive circuit, and the DC balancing electric motor is driven in accordance with the magnitude and the polarity thereof.

The roller for correcting the misalignment of the original copy and the copying paper, is mechanically interlocked to the DC balancing motor, and the position of the copying paper having been set as far as the position of the said roller, is automatically corrected in advance.

The copying paper can be further advanced when the copying speed is relatively higher.

The reason for this is that, the time lag from the time when the front end of the original copy is detected to the time when the copying paper starts, is always constant, and therefore, when the travelling speed of the original copy is greater, the amount of the progress of the original copy before the copying paper starts, becomes greater.

The slide contact of the potentiometer is mechanically interlocked to the above mentioned DC balancing motor and is moved, and the electric motor is stopped at the position when the voltage of the slide contact becomes equal to the voltage of the armature. Therefore, the DC balancing motor and the correction roller are rotated in accordance with the predetermined copying speed, and the copying paper is automatically set in advance at the position corresponding to the copying speed.

Other objects and the features of the present invention will be more clearly understood from the following detailed explanations about the embodiments of the present invention in accordance with the attached drawings.

## BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. 1 shows the main portion of the duplicator having the correction device of the present invention; FIG. 2 shows the relation of the respective members of the device of the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENT:

In FIG. 1, feed-roller 2 is provided in a punched hole 1a of an original copy guiding plate 1, and a press-roller 3 is press-contacted against the feed-roller 2.

An operation member 4a of a 4 is provided in a punched hole 1b of the original copy guiding plate 1.

A copying paper position adjusting roller 8 is provided within a punched hole 5b of a copying paper guiding plate 5, and the roller 8 is driven by a DC balancing motor 9.

The DC balancing motor 9 is driven by the differential voltage between the armature voltage of a DC elec-

tric motor 7 and the voltage of the slide contact of a potentiometer 10 to which constant voltage is applied.

A rod 12 is provided on the main body of the device rotatably by means of a pin 11, and on both ends thereof, press-rollers 13, 14 are supported respectively against feed-roller 6 and an adjustment roller 8.

Iron piece 15 is fixed on the opposite side of the pressroller 14, with respect to adjustment roller 8 of the rod 12, and a solenoid 16 is operated by means of a microswitch that is fixed on the main body of the device.

A device 17 for feeding copying papers is provided on one end of the copying paper guiding plate 5. On the crossing point of the original copy guiding plate 1 and the copying paper guiding plate 5, the interval 1C is provided. The feed rollers 2 and 6 are respectively driven by the DC electric motor 7. DC balancing motor 9, copying paper correcting roller 8 and the slide contact of the potentiometer 10 are mechanically interlocked.

FIG. 2 shows schematically electrical circuit features of the device of the present invention. In the diagram, 18 is a smoothing circuit; 19 is a DC-AC converting circuit; 20 is an amplifier circuit; 21 is a phase sensitive circuit; and 22 is the slide contact of the potentiometer 10. The constant circuit 23 stabilizes the output voltage of the electric source circuit 24. Numeral 25 is the original copy; 26 is the copying paper.

In the state of FIG. 1, when DC electric motor 7 is driven, the feed rollers 2 and 6 are rotated, and the original copy starts moving, but the copying paper 26 is still. When the end of the original copy 25 pushes the operation member 4a of the micro-switch 4, and when said member 4a is rotated in the clockwise direction in FIG. 1, the solenoid 16 is energized. Therefore, the iron piece 15 is attracted by the solenoid 16, and the rod 12 is rotated in the clockwise direction round the pin 11, and the press roller 13 press-contacts the copying paper 26 against the feed roller 6. At the same time the press-roller 14 is separated from the copying paper 26 on the adjustment roller 8. Therefore, the copying paper 26 moves to the left over the guide plate 5, and the end thereof is carried to the exposing device (not shown) in such a state that the front end thereof is laid over the original copy so as to be aligned with the front end of the original copy 25 at the interval 1c. In the diagram, the feeding devices other than 2, 3 and 6, 13 are omitted from the diagram for the sake of convenience.

When the feeding of the copying paper 26 is terminated, and the next copying paper is sent from the copying paper feeding device 17, and when the end thereof contacts the adjustment roller 8, the rear end of the original copy 25 passes through the micro-switch 4 (a synchronizing device is not shown but is present in the actual apparatus) and the operation member 4a is returned by a spring force thereof, and the energizing of the solenoid 16 is cut off.

The rod 12 is also rotated in the counter clockwise direction by means of a spring force thereof, and the press-roller 13 is separated from the copying paper 26 on the feed-roller 6, and at the same time, the press-roller 14 pinches the end of the copying paper 26 between the adjustment roller and said press-roller 14. When the next original copy 25 is sent, the above mentioned operations are repeated.

It is desirable that the time lag from the time when the front end of the original copy 25 is detected to the time when the press-roller 13 press-contacts the copying paper 26 against the feed-roller 6, and the time lag from the time when the rear end of the original copy 25 is detected to the time when the press-roller 14 press-contacts the copying paper 26 against the adjustment roller 8, should be equal. The reason for this is that when the two time lags are not equal, misalignment is gradually brought about between the original copy and the copying paper.

When the duplicator is set at a predetermined copying speed, the corresponding armature voltage of DC electric motor 7 is determined. This voltage is smoothed by the smoothing circuit 18, and is applied to the DC-AC converting circuit 19 along with the voltage from the slide contact 22 of the potentiometer 10.

The differential voltage of the two DC voltages is converted into alternating current, and is amplified by AC amplifying circuit 20 and the polarity of said differential voltage is detected by the synchronizing rectifier circuit 21, and accordingly the balance DC electric motor 9 revolves.

The slide contact 22 of the potentiometer 10 is mechanically interlocked to the above mentioned DC balancing motor 9, and is moved along with said electric motor, and is stopped when said two DC voltages are made equal.

In addition, the adjustment roller 8 is interlocked to the balance DC electric motor 9, and is rotated by the motor, and therefore the copying paper 22 is set at the position corresponding to the predetermined copying speed.

Therefore, when the copying speed is changed after setting the copying papers, the position of the copying paper 26 can be automatically adjusted in accordance with the newly set copying speed.

I claim:

1. A feed system for a duplicator for feeding original and copying paper, comprising a DC motor, means coupled to said DC motor for feeding said original, means for detecting the passage of the leading and trailing edges of said original past a given point, a feed roller for said copying paper coupled to said DC motor, a compensating roller positioned to engage said copying paper, a DC balancing motor, a potentiometer having a tap, means applying a constant voltage to said potentiometer, means applying a voltage corresponding to the difference voltage between the voltage on said tap and the armature voltage of said first mentioned DC motor to said balancing motor, said balancing motor being mechanically coupled to said tap whereby said balancing motor operates only when said difference voltage exists, means mechanically coupling said balancing motor to said compensating roller said compensating roller being adjusted through said mechanical coupling upon change of speed of said first mentioned DC motor to adjust the position of said copying paper, and means for selectively effecting drive of said copying paper responsive to detection of the leading edge of said original whereby said copying paper is driven by said feed roller following the detection of the passage of said leading edge of the original past said point.

2. The feed system of claim 1 wherein said means for selectively effecting drive of said copying paper com-

5

prises a pivot lever having first roller means at one end opposed to said feed roller and said second roller means at the other end opposed to said compensating roller, means responsive to the detection of said original past said point for moving said first roller means

6

toward said feed roller, and responsive to the detection of said trailing edge past said point for moving said second roller means toward said compensating roller.

\* \* \* \* \*

10

15

20

25

30

35

40

45

50

55

60

65

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,817,515 Dated June 18, 1974

Inventor(s) Satoshi Kanda

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

- Column 1, Line 62: "n=Ea-IR/K $\phi$ " should be --n =  $\frac{Ea-IR}{K\phi}$ --
- Column 2, Line 59: "microswitch" should be inserted before  
"4 is provided"
- Column 3, Line 40: "tone" should be --time--
- Line 6: "a against" should be --against a--
- Line 51: "eeding" should be --feeding--

Signed and sealed this 24th day of December 1974.

(SEAL)  
Attest:

McCOY M. GIBSON JR.  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents