

July 1, 1969

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AUTOMATIC SEPARATION MECHANISM FOR SEPARATING
AN ORIGINAL FORM AND A LIGHT SENSITIVE
COPY SHEET IN A COPYING MACHINE
Filed Aug. 28, 1967

3,452,980

Fig. 1.

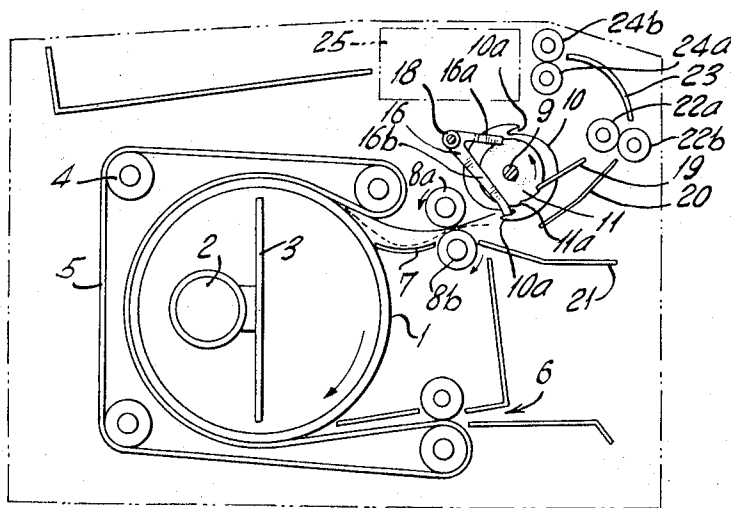


Fig. 2A.

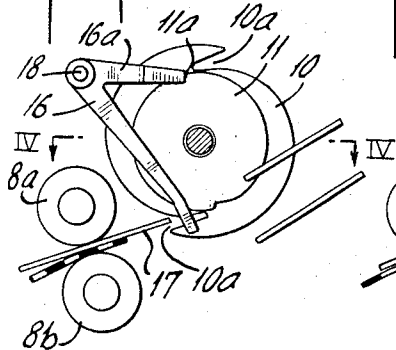


Fig. 2B.

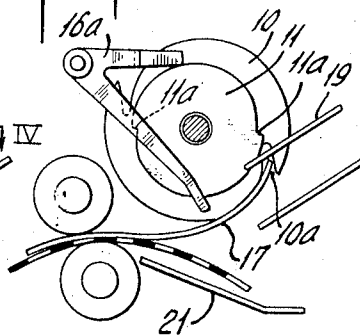


Fig. 2C.

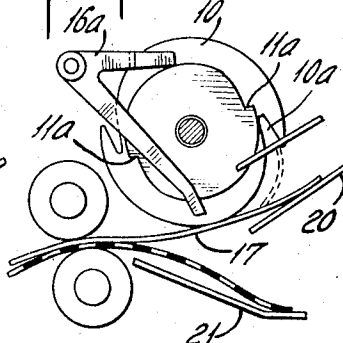


Fig. 3.

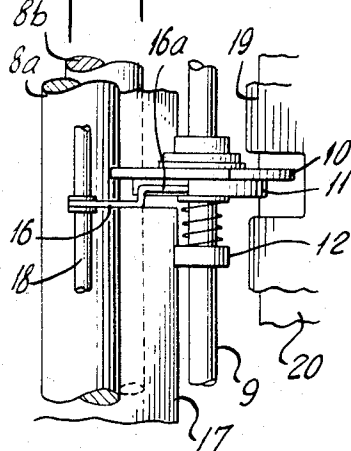


Fig. 4.

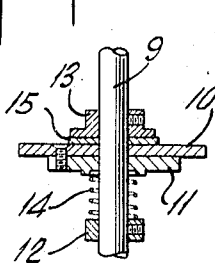
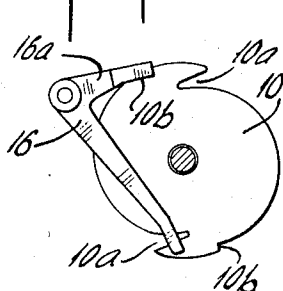


Fig. 5.



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AUTOMATIC SEPARATION MECHANISM FOR SEPARATING AN ORIGINAL FORM AND A LIGHT SENSITIVE COPY SHEET IN A COPYING MACHINE

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Filed Aug. 28, 1967, Ser. No. 663,679
Int. Cl. B65h 29/58

U.S. Cl. 271—64

2 Claims

ABSTRACT OF THE DISCLOSURE

A sheet separating device for a copying machine including a rotatable separating member having peripheral tangentially addressed notches, the open face of said notches looking backward in relation to the direction of rotation of the separating member, a bell crank stopper member pivoted adjacent to said separating member and adapted to be tripped by an edge of a sheet passing through the copy machine to permit limited rotation of said separating member, obstruction and receiving plates for removing the edge of the sheet from the separating member and guiding it toward the discharge of said machine.

Brief description of the accompanying drawings

FIG. 1 is a side view of a copying machine incorporating one embodiment of the present invention.

FIG. 2 is a side view illustrating main part only of the present invention, with (a) showing one mode of an original form overlaid on a light sensitive copy sheet (b) illustrating a mode of the original form and the copy sheet being separated and (c) representing status of the original form and the copy sheet which have just been separated from each other.

FIG. 3 is a plan view of the above FIG. 2(a).

FIG. 4 is a sectional view taken along dot-and-dash lines IV—IV of FIG. 2(a).

FIG. 5 is a side view of another embodiment of the present invention, showing main part only.

Detailed description of this invention

This invention relates to an automatic separation mechanism for separating an original form and a copy sheet in a copying machine. A known automatic separation mechanism for the same purpose utilizing, for example, vacuum suction had a drawback of its structure being complicated and bulky, because of which its application to small-sized copying machines was impossible. Automatic separation-mechanisms known in the art of relatively simple structure had a drawback in that they require utmost care for operation as they were apt to cause, with slight deviations from the predetermined direction of the copy sheet, inaccurate separation of the original form and the copy sheet or erroneous delivery of an original form to a developing mechanism together with a copy sheet.

One of the objects of the present invention is to provide an automatic separation mechanism of simple structure and accurate separation performance. It is characterized in that it is so designed as to guide an original form and a copy sheet to a pair of guide rollers which will be delivered from a printing mechanism, while the delivery side of said guide rollers is faced with a notch formed on a rotatable plate which is frictionally provided on a rotary axis which runs parallel to said guide rollers, beside said notch being provided with a free end of an oscillating member engageable, at one portion thereof, with said rotatable plate, so that, when the leading edge of a copy sheet enters said notch, the leading edge of the copy sheet

is adapted to release engagement between said rotatable plate and the oscillating member, whereby the rotatable plate is adapted to rotate integrally with its rotary axis, curling thereby the leading edge of the copy sheet upward.

For a fuller understanding of the nature and the objects of this invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

Numeral 1 shows a transparent printing cylinder. 2 is a cylindrical printing lamp and 3, a reflector. As shown in the art, said transparent printing cylinder 1 is adapted to be rotated in the direction of the arrow by and within a loop of endless belts 5 which is extended over a plurality of rollers 4 so that an original form and a light sensitive copy sheet which are fed from an opening 6 can be delivered onto a receiving plate 7 after being printed by aforesaid lamp 2.

In front (at right facing the figures) of said receiving plate 7 are provided a pair of guide rollers 8a and 8b which are respectively driven in the direction of the arrow by a suitable driving device, whereby an original form and a copy sheet delivered from the printing device are adapted to be transported approximately in the forward direction.

At upper right (facing FIG. 1) of said guide roller 8a is provided an axis 9 rotating in the same direction therewith. Said axis 9 is loosely fitted with a rotatable plate 10 carrying notches 10a on its periphery and a disc 11 which is substantially integral with said rotatable plate 10 and which forms on its periphery as many stages 11a as said notches 10a. Said rotatable plate 10 and the disc 11 are provided, as shown in FIG. 4, between collars 12 and 13 which are fixed on the axis 9 and by virtue of elasticity of an expansible spring 14 interposed between said collar 12 and the disc 11, both rotatable plate 10 and the disc 11 are pressed upon the collar 13 through a friction member 15. This permits rotation of the axis 9 when movement of the axis rotatable plate 10 and the disc 11 are arrested.

At upper left direction of said rotatable axis 9 is provided an oscillating member 16 of bell crank shape pivoted at 18 on a stationary member, with one arm 16a engaging, at its end, with stages 11a of the aforesaid disc 11, thereby preventing rotary movement of the disc 11 in the direction of the arrow. A free end of another arm 16b of said oscillating member 16 is positioned, at proximity of notches 10a of the rotatable plate 10, in such a manner as to traverse said notches 10a. Although the notches 10a to be formed on the aforesaid rotatable plate 10 are illustrated in the figures in two locations, 1 to 5 notches can be provided depending upon the size of the rotatable plate 10. In any event, in a status where movement of the aforesaid rotatable plate 10 is prevented by the oscillating member 16, one of said notches 10a is adapted to face, at its open end, against guide rollers 8a and 8b within the path of light sensitive copy sheet which will be delivered from said rollers.

Now, when an original form and a copy sheet overlaid therewith are fed into an opening 6 in such a manner as the leading edge of the original form would slightly precede that of the copy sheet, the original form and the copy sheet are transported through the printing device and advanced forward by guide rollers 8a and 8b as shown in FIG. 2(a). The leading edge of the light sensitive copy sheet 17 thus enters a notch 10a of the rotatable plate 10, striking against a free end of the oscillating member 16 which, whereupon, is rotated in a counterclockwise direction around its axis 18, causing the extremity of its arm 16a to disengage from a stage 11a of the disc 11. The rotatable disc 10 thereupon starts counterclockwise revolution together with its axis 9. FIG. 2(b) illustrates the

aforesaid rotatable disc 10 rotated approximately 90 degrees from a position shown in FIG. 2(a) accompanying leading edge of the copy sheet which is prevented from further forwarding movement by the bottom surface of an obstruction plate 19. FIG. 2(c) shows the rotatable disc 10 being further rotated in a counterclockwise direction from a position shown in FIG. 2(b), with the leading edge of the copy sheet released from a notch 10a and resting on a receiving plate 20. Under all circumstances, movement velocity of notches 10a is predetermined to approximately equal the movement velocity of the copy sheet.

The original form, on the other hand, is advanced in a forward and downward direction as shown in FIG. 2(b) and delivered onto a receiving plate 21 while the copy sheet makes a movement as described above. The copy sheet thus separated from the original form is fed into a developing device 25 through guidance of rollers 22a, and 22b, guide member 23 and rollers 24a and 24b, as shown in FIG. 1.

The arm 16a of the oscillating member 16 disengaged from a stage 11a of the rotatable disc 11 as shown in FIGS. 2(a) and (b) is kept pressed on the circumference of the disc 11 by its weight or by the elasticity of a relatively weak spring, until it is engaged with the next stage of the rotatable disc 11 so as to stop rotary movement of said disc and rotatable plate 10.

As an alternative of an arm 16a of the aforesaid oscillating member 16 cooperating with a disc 11, the rotatable plate 10 can be so designed as to form stages 10b, as shown in FIG. 5, so as to directly engage and disengage with the oscillating member 16.

Preferably, it is desirable to provide plurality of the above mentioned rotatable plate 10 in the direction of width of the copy sheet. Further, by constructing and arranging the guide rollers 8a and 8b so that the guide roller 8b will produce a circumferential velocity equal to that of the printing cylinder but smaller than that of the guide roller 8a, the original form and the copy sheet can be fed into a feeding mouth 6 with their respective leading edges strictly aligned with each other, because, the greater circumferential velocity of 8a will cause the leading edge of the copy sheet to always precede that of the original form, thereby preventing any possibility of the leading edge of the original form entering a notch 10a of the rotatable plate 10. Thus, despite its simple structure, the present invention ensures an accurate separation performance. Furthermore, the simple structure comprising a rotatable plate carrying notches and an oscillating

member controlling rotary movement of said plate enables manufacture of a compact automatic separation device, which makes incorporation of said device into a small-sized copying machine possible and easy. Still further, the present invention eliminates a drawback of an original form erroneously being delivered to a developing section by virtue of the original form entering into the aforesaid notch, because the notches on the rotatable plate 10 are adapted to be moved together with the movement of the light sensitive copy sheet.

I claim:

1. An automatic separation device to be used in a copying machine for separating an original form and a light sensitive copy sheet, characterized in that an original form and a copy sheet which are delivered from a printing device are adapted to be directed to a pair of guide rollers, the delivery side of which guide rollers is faced with a notch formed on a rotatable plate frictionally mounted on a rotary axis running parallel to said guide rollers, beside said notch being provided a free end of an oscillating member which engages and disengages, at one portion thereof, with said rotatable plate, so that, when the leading edge of said copy sheet enters said notch, said leading edge of the copy sheet being adapted to cause disengagement of the aforesaid rotatable plate and the oscillating member as well as integral rotation of the rotatable plate with its axis, an obstruction plate adapted to intercept the leading edge of said copy sheet while in said notch, curl said sheet, and remove it from said rotatable plate and permit said sheet to engage a guide plate which directs said sheet toward the discharge from said copying machine.

2. An automatic separating device according to claim 1, having a friction clutch connecting said rotatable plate and rotary axis comprising a pair of spaced stationary collars fixed to said axis, an annular friction pad adjacent one of said collars, a coil spring surrounding said axis and adjacent said other collar, said rotatable plate on said axis between said spring and said friction pad and said spring biased to press said pad and plate together in frictional contact.

References Cited

FOREIGN PATENTS

873,719 7/1961 Great Britain.

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