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[54] **SHEET STRIPPING DEVICE FOR AN ELECTROPHOTOGRAPHIC COPYING APPARATUS**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **271/174;** 271/DIG. 2

[51] **Int. Cl.** **B65h 29/56**

[58] **Field of Search** 271/DIG. 2, 80, 174, 172

[56] **References Cited**

UNITED STATES PATENTS

3,450,402 6/1969 Weiler 271/80

3,820,776 6/1974 Fujimoto et al. 271/80

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[57] **ABSTRACT**

A device comprising a sheet stripping member disposed at and maintained in pressing engagement with one marginal portion of the periphery of a drum with which one lateral marginal portion of a sheet is brought into pressing engagement, and a sheet stripping claw means comprising a plurality of stripping claws each formed with a plurality of teeth to catch the leading end of the sheet separated from the periphery of the drum by the sheet stripping member whereby the sheet can be stripped off and removed from the periphery of the drum.

5 Claims, 3 Drawing Figures

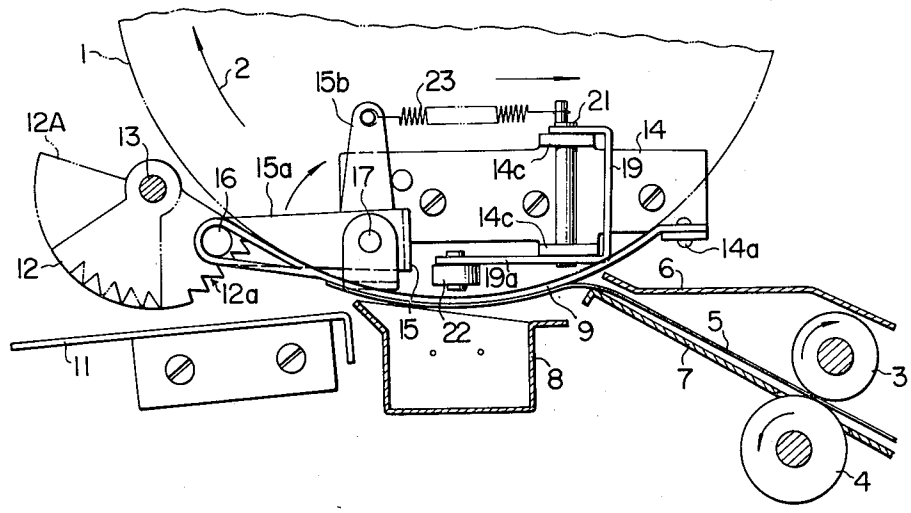


FIG. 1

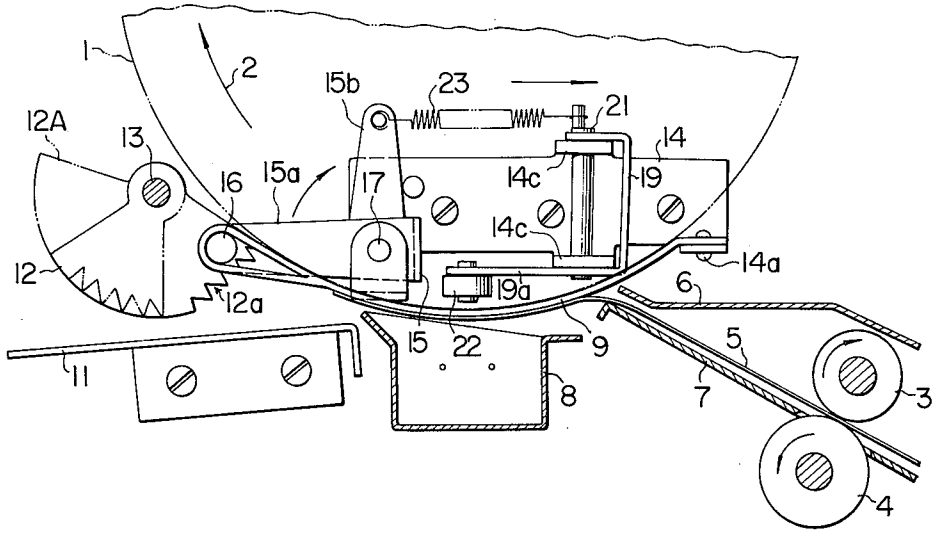


FIG. 3

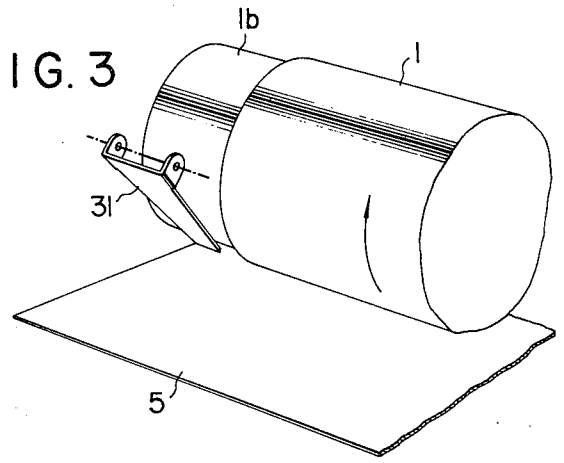
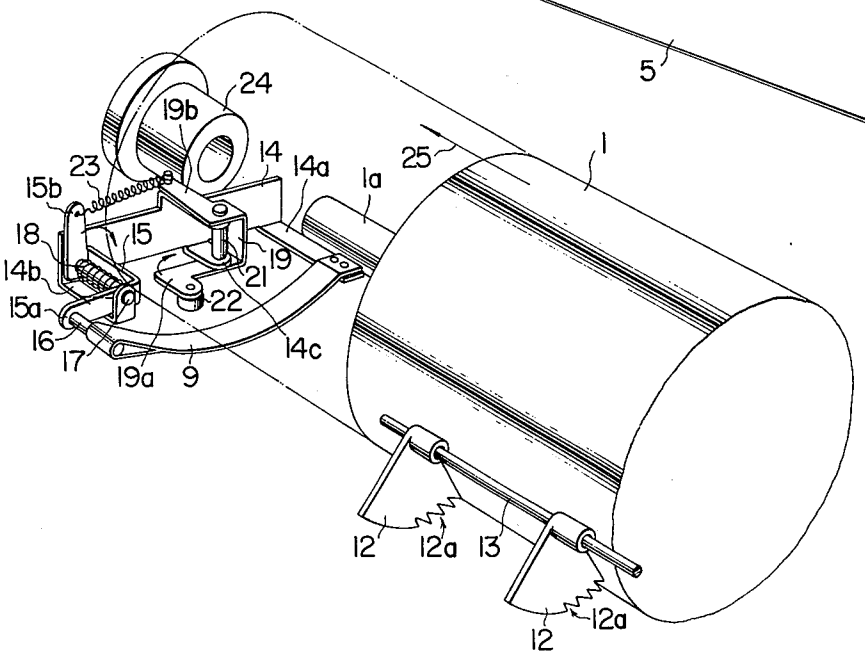


FIG. 2



SHEET STRIPPING DEVICE FOR AN ELECTROPHOTOGRAPHIC COPYING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a device for stripping off the periphery of a rotating drum a sheet which is in intimate contact with the periphery of the drum.

In one method of producing a duplicate of an original by an electrophotographic copying apparatus known in the art, the photoconductive photosensitive layer formed on the periphery of a drum is uniformly charged by a corona discharge and the charged photosensitive layer is exposed to an optical image of the original to be duplicated to form on the periphery of the drum an electrostatic latent image of the original which is developed by using toner particles into a visible toner image. The visible toner image is printed by transfer printing on a copy sheet brought into pressing engagement with the periphery of the drum and fixed before a duplicate is produced.

In carrying this method into practice, some means must be provided for removing from the periphery of the drum a copy sheet which is brought into pressing engagement with the periphery of the drum for printing the toner image thereon by transfer printing. It is known to use means whereby an air stream is blown into a space between the periphery of the drum and the copy sheet in engagement therewith. This has the disadvantage of the toner particles being blown off the sheet, thereby destroying the visible image. It is also known to use means whereby a pick-off claw means is actuated in synchronism with the rotation of the drum so that the claw means may be brought into engagement with the periphery of the drum when the leading end of the sheet in engagement with the drum is disposed immediately above the claw means. This has disadvantages in that a synchronizing means is required to synchronize the actuation of the pick-off claw means with the rotation of the drum and that the surface of the periphery of the drum tends to be damaged by the claw means.

SUMMARY OF THE INVENTION

This invention has as its object the provision of a sheet stripping device for an electrophotographic copying apparatus which permits a copy sheet to be positively stripped off the periphery of the drum without damaging the periphery of the drum and which can be actuated independently of the rotation of the drum and the feeding of copy sheets.

According to the invention, a copy sheet in pressing engagement with the periphery of the drum is stripped off the drum at one corner by stripping member disposed at one end of the drum and then caught at its leading end by a sheet stripping claw means comprising a plurality of sheet stripping claws each for moving the sheet on to a guide plate. The sheet stripping member which is in a loosened position before the drum is assembled is tensioned when the drum is assembled so that it is automatically brought into pressing engagement with a desired portion of the periphery of the drum. This saves a lot of time and labor in mounting and adjusting the sheet stripping member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view of the sheet stripping device comprising one embodiment of the invention;

FIG. 2 is a perspective view of the device shown in FIG. 1; and

FIG. 3 is a perspective view of another form of sheet stripping member.

DESCRIPTION OF EMBODIMENTS

In FIG. 1, a drum 1 formed on its periphery with a photoconductive photosensitive layer (not shown) continuously rotates in the direction of an arrow 2, with a toner image (not shown) being formed on the photosensitive layer by a known method. A pair of delivery rollers 3, 4 rotate in the directions of arrows shown thereon to deliver a copy sheet 5 toward the periphery of the drum 1 through a passageway between guide plates 6, 7. The copy sheet thus delivered is brought into pressing engagement with the periphery of the drum 1 by a transfer-printing charger 8, so that the toner image on the periphery of the drum 1 is printed on the copy sheet 5 by transfer printing.

A sheet stripping member 9 which may be a thin wire or relatively thin belt is disposed at one marginal portion of the periphery of the drum 1 and maintained in pressing engagement with the periphery of the drum 1 as subsequently to be described. Thus, one lateral marginal portion of the copy sheet 5 rides on the stripping member without coming into direct engagement with the periphery of the drum 1. Disposed below the discharge end of the sheet stripping member 9 is a guide plate 11 for guiding the copy sheet 5 after the latter is stripped off the periphery of the drum 1. Disposed above the guide plate 11 are a plurality of stripping claws 12 each being segmental in shape and formed at the peripheral edge with a plurality of teeth 12*a*. The stripping claws 12 are supported at their bases by a support shaft 13 for free pivotal movement independently of one another.

The sheet stripping member 9 maintained in pressing engagement with the periphery of the drum 1 is affixed at one end to one arm 14*a* of a support member 14 and locked at the other end by a pin 16 affixed to one arm 15*a* of a holding member 15 mounted through a shaft 17 on the other arm 14*b* of the support member 14. The holding member 15 is urged to move counter clockwise about the shaft 17 in FIG. 1 by the biasing force of a spring 18 connected at one end to the support member 14 and at the other end to the arm 15*a* of the holding member 15. Provided in the central portion of the support member 14 are two arms 14*c*, 14*c* which support at their forward end portions an actuation member 19 through a shaft 21. The actuation member 19 is formed at its lower end with an arm 19*a* which has a roller 22 mounted through a shaft at its free end, and at its upper end with another arm 19*b*. A compression spring 23 is mounted between the upper arm 19*b* and another arm 15*b* of the holding member 15.

In FIG. 2, when the periphery of the drum 1 is not in engagement with the sheet stripping member 9 or a shaft 1*a* supporting the drum 1 is not fitted in a bearing 24 affixed to an immovable member, the holding member 15 is in an inoperative position in which it is brought into pressing engagement with the arm 14*b* of the support member 14 by the biasing force of spring 18 and, as a result, the sheet stripping member 9 is in

a loosened position. In assembling the drum **1**, the drum **1** is moved in the direction of an arrow **25** and the shaft **1***a* is inserted in the bearing **24**. During this operation, the roller **22** is pushed and moved by the end of the drum **1** so as to move the actuation member **19** in the direction of an arrow shown thereon. This causes the holding member **15** connected to the actuation member **19** through spring **23** to move in the direction of an arrow shown thereon. As a result, the sheet stripping member **9** is automatically tensioned and brought into intimate contact with one marginal portion of the periphery of the drum **1** with a suitable force.

If the copy sheet **5** is fed to the drum **1** disposed in its operative position as aforementioned and the leading end of the copy sheet **5** draws near the discharge-end of the sheet stripping member **9** after the toner image is printed on the copy sheet **5** by transfer printing, then a corner of the copy sheet **5** which is juxtaposed against the sheet stripping member **9** is stripped off the periphery of the drum **1** and guided by the discharge end of the member **9** to move away from the drum **1**. As a result, the leading end of the copy sheet **5** is stripped off the periphery of the drum **1** in such a manner that the clearance between the copy sheet and the drum is greater on the end of the drum at which the sheet stripping member **9** is disposed and becomes smaller in going toward the other end of the drum. As the copy sheet **5** moves in this condition, the leading end of the copy sheet **5** is brought into abutting engagement with the teeth **12***a* of the stripping claws **12** and moves the stripping claws **12** to a position designated at **12A**. The stripping claws **12** which are in thin plate form and made of Mylar or other synthetic resinous material of light weight are spaced apart at their peripheral edges from the periphery of the drum **1** a small distance and can move in pivotal movement about the shaft **13** independently of one another. Thus, the stripping claws **12** can be actuated at different times. As aforementioned, the forward end of the copy sheet **5** stripped by the stripping member **9** is inclined with respect to the periphery of the drum **1** with the clearance between the copy sheet and the drum varying in going from one end to the other of the drum **1**. However, since the stripping claws **12** are each formed therein with a plurality of teeth, the leading end of the copy sheet **5** can be positively caught by any one of these teeth of the stripping claws **12**. As the stripping claws **12** move to the imaginary position **12A**, the leading end of the copy sheet **5** is positively separated from the periphery of the drum **1** and moved on to the guide plate **11**.

By stripping one portion of the copy sheet **5** off the periphery of the drum **1** by the sheet stripping member **9** to initiate a sheet stripping operation and then bringing the leading end of the copy sheet into engagement with the teeth of the plurality of stripping claws **12**, it is possible to separate the copy sheet **5** from the periphery of the drum **1** without requiring the use of means for synchronizing the rotation of the drum **1** or the feeding of copy sheets with the actuation of the sheet stripping device and without damaging the periphery of the drum **1** by the sheet stripping claws. In an alternative embodiment for initiating a sheet stripping operation, a stripping member **31** shown in FIG. **3** may be used. If this is the case, a smaller diameter portion **1***b* is formed at one marginal portion of the periphery of the drum **1** and the stripping member **31** affixed at the base to an immovable member is maintained at its free end in pressing engagement with the small diameter portion **1***b* of the drum **1** at all times. By this arrangement, it is possible for the stripping member **31** to strip one corner of the sheet **5** off the periphery of the drum **1**, thereby initiating a sheet stripping operation.

What is claimed is:

1. In an electrophotographic printing apparatus, having a continuously rotating cylindrical drum, means for feeding a copy sheet into engagement with the periphery of the drum and means for receiving the printed copy sheet, the improvement comprising:

a. a sheet stripping member having one end engaging one marginal portion of the drum periphery and positioned between the drum periphery and one lateral margin of the copy sheet, and having a second end extending substantially tangentially from the drum periphery such that the one lateral margin and the leading margin of the copy sheet ride over the sheet stripping member and disengage the drum periphery as the drum and the copy sheet rotate together; and

b. sheet stripping claw means spaced from the drum periphery and adapted to catch the leading margin of the copy sheet after it disengages the drum periphery to direct the copy sheet away from the drum onto the receiving means.

2. Apparatus according to claim **1** wherein said sheet stripping member comprises an elongated, thin member mounted at one end to an immovable portion of said apparatus and further comprising means positioned at the second end of the member for biasing the member toward engagement with the drum periphery.

3. Apparatus according to claim **1** wherein said sheet stripping member comprises an elongated, thin member mounted at the second end to an immovable portion of said apparatus and further comprising means for maintaining the member in pressing engagement with the drum periphery at the first end.

4. Apparatus according to claim **3** wherein the drum periphery has a smaller diameter at the one marginal portion engaged by the sheet stripping member.

5. Apparatus according to claim **1** wherein the sheet stripping claw means comprises a shaft mounted substantially parallel to the axis of the drum and at least one toothed segment pivotally supported by the shaft for catching the leading margin of the copy sheet as it disengages the drum periphery.

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