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Bar-On

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[54] **SHEET STRIPPING APPARATUS**

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

[58] **Field of Search** ..... 271/DIG. 2, DIG. 3, 80, 271/174, 260; 226/5, 22

[56] **References Cited**

UNITED STATES PATENTS

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2,842,362	7/1958	Hayes et al.	271/DIG. 2
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FOREIGN PATENTS OR APPLICATIONS

933,090	9/1955	Germany	271/DIG. 2

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[57] **ABSTRACT**

An automatically positionable sheet stripping finger for removing individual sheets of final support material from a moving photosensitive plate suitable for use in the automatic xerographic process. The stripper finger is supported upon a pivot arm provided with a pneumatic sensing nozzle capable of sensing the pressure maintained between the finger and the photosensitive plate surface. The nozzle, in turn, is operatively connected to an amplifier which is arranged to control the positioning of the lever arm in response to the back pressure developed at the nozzle. As the stripper finger moves toward or away from the operative position, the back pressure changes thus causing the amplifier to move the lever arm in a direction so as to restore the finger to the desired sheet stripping position.

5 Claims, 2 Drawing Figures

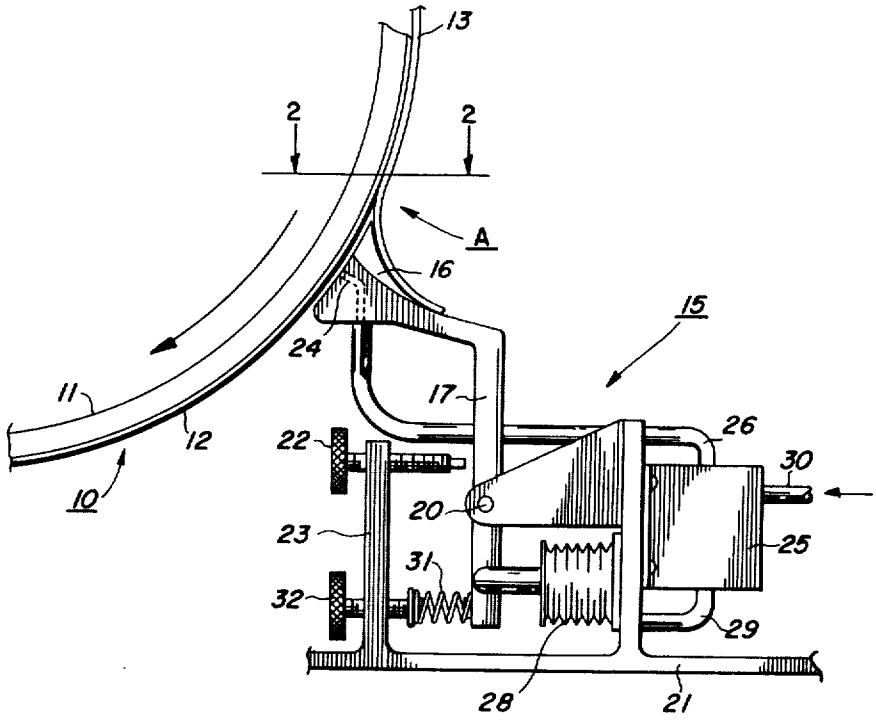


FIG. 1

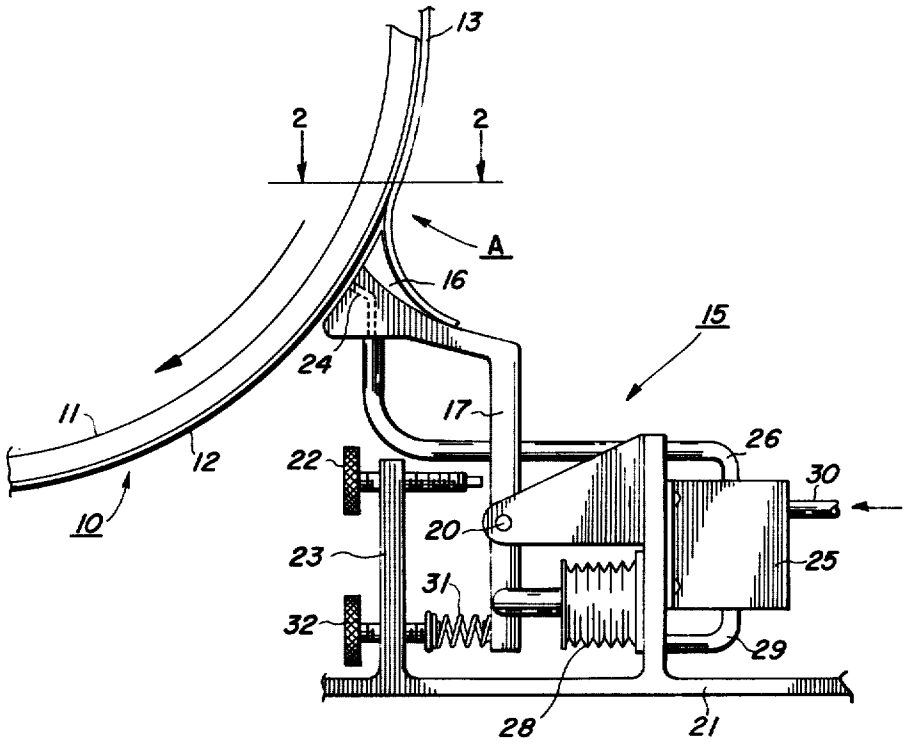
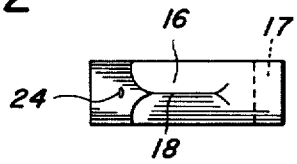


FIG. 2



SHEET STRIPPING APPARATUS

This invention relates to a sheet stripping device and, in particular, to apparatus for automatically supporting a sheet stripping finger at a predetermined position in regard to a moving sheet support surface from which a sheet of material is to be removed.

In many automatic copying machines, and in particular in the automatic reusable xerographic copying process, it is important to unerringly and repeatedly remove copy sheets from the surface of a photosensitive plate or the like during the course of the copying process. When the sheet removal or stripping device fails, the copy sheet carried on the plate surface is generally brought forward into subsequent processing stations where the sheet can produce a malfunctioning of the systems involved or, in the extreme case, even damage the automatic device.

Mechanical stripping devices such as that disclosed in U.S. Pat. No. 3,578,859 and pneumatic stripping devices as disclosed in U.S. Pat. No. 3,090,696 have been used for quite some time in the copying art with varying degrees of success. However, all these devices suffer from the same disadvantages in that they eventually are subject to misalignment problems whereby the stripping mechanism fails to act upon the sheet either at the proper time or place. As a result the sheet either remains upon the support surface or is distorted during the removal operation thus causing the machine to malfunction. In the case of a mechanical sheet removal device of the type wherein a mechanical pick off finger is introduced between the photosensitive plate and the support sheet carried thereon, misalignment of the finger can also cause the finger to contact and thus abrade the relatively delicate photosensitive plate surface thereby necessitating a replacement of the plate within the automatic machine. Any of these malfunctions can seriously impair the reliability of the automatic copying device involving a great deal of lost machine time and, in extreme cases, can lead to the damaging of machine components.

It is therefore an object of the present invention to improve apparatus for effecting the removal of a sheet or the like from a moving support member.

A further object of the present invention is to improve sheet stripping devices used in automatic copying machines.

A still further object of the present invention is to provide a reliable sheet removal device for removing a copy sheet from a moving photosensitive plate.

Yet another object of the present invention is to alleviate sheet stripping problems in xerography.

Another object of the present invention is to provide a sheet stripping mechanism capable of unerringly and repeatably removing copy sheets from a moving support surface.

These and other objects of the present invention are attained by means of a mechanical stripper finger positioned at a predetermined location in close proximity to a moving sheet support surface wherein the tip of the finger is capable of moving between the support surface and a sheet carried thereon, a pneumatic sensing means arranged to sense the pressure between the finger and the support surface and fluid amplifier operatively associated with the sensing means for automatically maintaining the position of the finger at a predetermined distance from the sheet support surface.

For a better understanding of the invention as well as other objects and further features thereof, reference is had to the following detailed description of the invention to be read in connection with the accompanying drawings, wherein:

FIG. **1** is a schematic view of a sheet stripping device embodying the teachings of the present invention illustrating a copy sheet in the process of being removed from the surface of a moving photoconductive drum;

FIG. **2** is a top view of the stripping device taken along line **2—2** shown in FIG. **1.**

Referring now to FIG. **1,** there is shown a sheet stripping device embodying the teachings of the present invention. The sheet stripping device will be herein described in reference to the automatic reusable xerographic process as disclosed in greater detail in the previously noted U.S. Pat. Nos. 3,090,616 and 3,578,859. However, it should be clear that the invention is not so limited to this particular usage and the invention has wider application in any embodiment wherein a sheet of material is to be removed from a moving support surface.

As previously noted in the heretofore mentioned U.S. patents, in the reusable xerographic process, a latent electrostatic image of an original to be copied is first recorded upon a moving photoconductive plate surface and the image is then rendered visible by applying a specially prepared charged toner material to the plate surface. A sheet of final support material, such as paper or the like, is placed in overlying contact with the imaged plate surface and the toner image is transferred electrically from the plate to the copy sheet. During the electrical image transfer step, the copy sheet normally becomes electrostatically tacked to the plate. The removal of the tacked sheet from the plate has posed a long standing problem in the xerographic art.

As shown in FIG. **1,** a stripping device, generally referenced **15,** is positioned adjacent to and in close non-contiguous relation with a moving xerographic drum **10** of the type commonly known and used in the art. The drum basically consists of a conductive substrate **11** over which is placed a photoconductive layer **12,** as for example selenium, and the drum mounted upon a shaft (not shown) and arranged to rotate in the direction indicated. A sheet of final support material **13,** to which the toner image has been previously transferred, is shown being carried forward on the drum surface into the sheet stripping or removal zone A.

The stripping device **15** generally includes a stripper finger, the apex of which is pointed upwardly in opposition to the direction of plate movement and a generally L-shaped lever arm **17.** In the preferred embodiment of the present invention, the stripping finger and the arm are constructed of a single piece of relatively rigid plastic material having a thin layer of polytriflouroethylene coated thereon which exhibits a relatively low surface energy in relation to the toner material which may come in contact therewith. Although a single piece construction is herein described, it should be clear that the finger and the lever arm could be similarly fabricated of two different parts and/or materials, which are operatively joined together, without departing from the teachings of the present invention.

In practice, the tip or apex of the finger is normally positioned close to the plate surface in non-contiguous relation at a predetermined position therewith. As the sheet of support material is forwarded in the stripping

station upon the drum surface, the tip of the finger is caused to move between the plate surface and the copy sheet. Further rotation of the drum causes the sheet to be redirected over the back side of the stripping device thereby effecting the desired sheet removal into further sheet handling means (not shown). A single sheet pick off finger is herein utilized with the tip of the finger being arranged to contact the copy sheet at approximately the longitudinal centerline thereof. As shown in FIG. **2** the upper surface **18** of the sheet stripping apparatus, that is, the surface coming in contact with the copy sheet during the stripping operation, is brought to a knife edge configuration in order to minimize disturbing any toner images upon the support sheet which might come in contact therewith.

The lever arm **17** is turned downwardly in a substantially vertical direction with the main body of the arm being supported upon a strategically located pivot pin **20** supported in the main frame **21** of the stripping apparatus. An adjustable stop mechanism which includes a set screw **22,** threaded into a vertical plate **23** of frame **21,** is adapted to act upon the left hand side wall of the lever arm above the pivot point. The set screw is adjusted so as to limit the movement of the arm, and thus the finger, in a counterclockwise direction whereby the finger cannot be forced into physical contact the sensitive photoconductive drum surface.

A sensing nozzle **24** is provided within the relatively wider main body of the finger element **16** with the nozzle orifice facing the moving drum surface just below the sheet pick off region. The nozzle is connected via line **26** to a fluid amplifier **25** of the type commonly known and used in the art, as for example that described in U.S. Pat. No 3,538,932. The amplifier is capable of sensing any changes in the back pressure exerted against the nozzle orifice in the pick off region and varying the pneumatic output of the amplifier in response to the pressure sensed. The output of the amplifier is connected to a bellows **28,** via line **29,** which is arranged to act against the lower portion of the lever arm below the pivot point. An air input to the amplifier network is provided by an input line **30** from any suitable source of supply.

The bellows is arranged to act against the force of a compression spring **31** operatively connected to the lever arm below the pivot point opposite to the bellows. The expansion spring is seated at one end against the left hand side wall of the arm **17** with the opposite end of the spring adjustably supported in vertical plate **23** by means of an adjusting screw **32** threaded within the plate. The pressure exerted upon the arm by the bellows and the spring are adjusted so that the two offset each other or balance when the finger is in a desired operative position. Movement of the pick off finger from the operative position towards the drum surface causes the pressure at the nozzle to increase. This, in turn, increases the output of the amplifier causing the bellows to expand against the lever arm thus tending to return the finger back towards the desired operative position. Similarly, if the finger is forced away from the drum surface, the back pressure at the nozzle decreases and the bellows force also decreases. Under the urging of the extension spring, the lever arm again returns towards the operative position. When the finger is returned to the desired stripping position, the bellows force once again balances the spring force and the system is restored to an equalibrium condition.

As can be seen, the finger arrangement provides a self regulating device which will continually position itself in relation to the moving drum surface regardless of any drum run-out or other eccentricities that might be established between the two coacting surfaces.

It should be clear to one skilled in the art that the positioning of the bellows and the spring **31** can be reversed to provide a failsafe system if an air failure should occur. In this particular arrangement, an inverter amplifier will be employed to reverse the function of the bellows and the spring will be arranged to move the finger away from the drum surface. As can be seen, if for some reason an air failure should occur, the spring will automatically move the finger back from the drum thereby preventing the sensitive photosensitive surface thereon from being abraded or otherwise harmed.

While this invention has been described with reference to the structure herein disclosed, it is not necessarily confined to the details as set forth and this particular application is intended to cover any modifications or changes as may come within the scope of the following claims.

What is claimed is:

1. Apparatus for removing a sheet of final support material from a moving photosensitive surface including:

sheet stripping means having a stripper element adapted to move between the support material and the moving photosensitive surface and a lever arm for movably supporting said stripper element adjacent to but spaced from the moving photosensitive surface,

said stripper element having an air passageway formed therein terminating in a port adjacent said photosensitive surface, said passageway being provided with a source of air, variation in the distance between said port and said photosensitive surface causing a variation in the air pressure within the passage in said stripper element,

means to movably support said lever arm whereby said stripper element is positionable relative to said moving photosensitive surface,

pneumatic means operatively connected to said lever arm for positioning said arm whereby said stripper element is supported in a predetermined position adjacent to but spaced from said moving photosensitive surface, and

control means operatively connected to said air passageway for actuating said pneumatic means in response to the pressure in said passageway whereby said lever arm is maintained in said predetermined position.

2. The apparatus of claim **1** wherein said control means comprises a fluid amplifier arranged to position said pneumatic means in response to the pressure in said passageway.

3. The apparatus of claim **2** wherein said pneumatic means includes a bellows means operatively connected to the fluid amplifier and a spring means acting upon said lever arm such that the bellows pressure and the spring force balance when said stripping means is in said predetermined position.

4. The apparatus of claim **1** further including stop means for preventing said sheet stripping means from contacting the photosensitive surface in the event said control means is inoperative.

5. The apparatus of claim **4,** having further means to adjust the spring force acting against said sheet stripping means.

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