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Hauck

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[54] **SELF-ACTIVATING CUTTER FOR STRIP MATERIAL**

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[73] Assignee: **Eastman Kodak Company,** Rochester, N.Y.

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[52] **U.S. Cl.** **355/29,** 83/205, 83/211, 355/13, 355/28

[51] **Int. Cl.** **G03b 29/00**

[58] **Field of Search** 355/13, 28, 29; 83/203, 205, 211, 611, 636, 847, 851, 854

[56] **References Cited**

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Assistant Examiner—E. M. Bero

Attorney—Robert W. Hampton et al.

[57] **ABSTRACT**

A cutting or severing device is disclosed in conjunction with a processing machine for heat development of latent images that are exposed successively on paper supplied in roll form. The strip of paper is moved from a supply roll through an exposure station to a pair of drive rolls. These rolls also move the strip of paper through suitable guide means to the surface of a rotating drum that is heated by a resiliently mounted shell that partially surrounds the drum. The guide means through which the strip of paper is moved to engage the drum comprises a fixed member on one side of the strip and a number of sections on the other side of the strip that are pivotally interconnected so as to be movable to a collapsed position when the length of the strip of paper between the drive rolls and drum is shortened to a prescribed amount. A cutting blade is coupled to one of the movable sections of the guide means and upon movement into the collapsed position, the blade is moved toward and into engagement with the strip of paper at a point between the drive rolls and the end of the guide means adjacent thereto.

16 Claims, 4 Drawing Figures

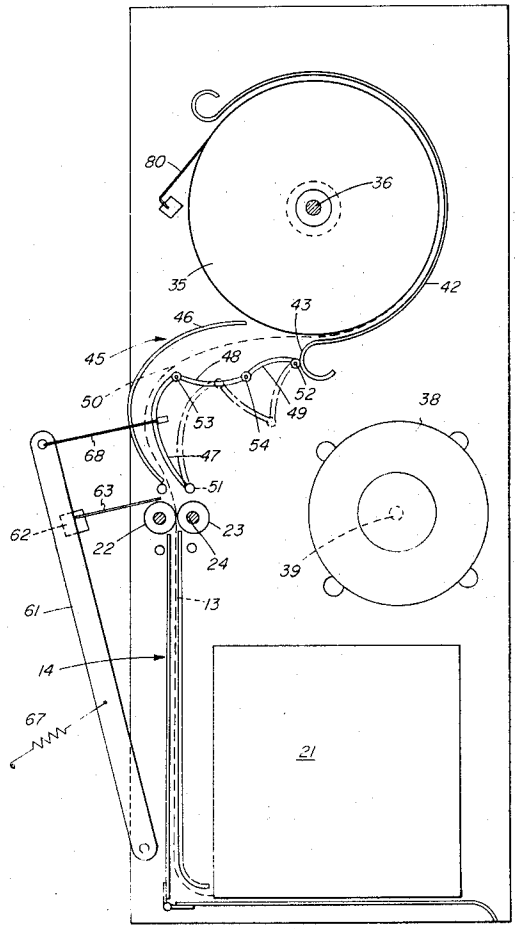

FIG. 1

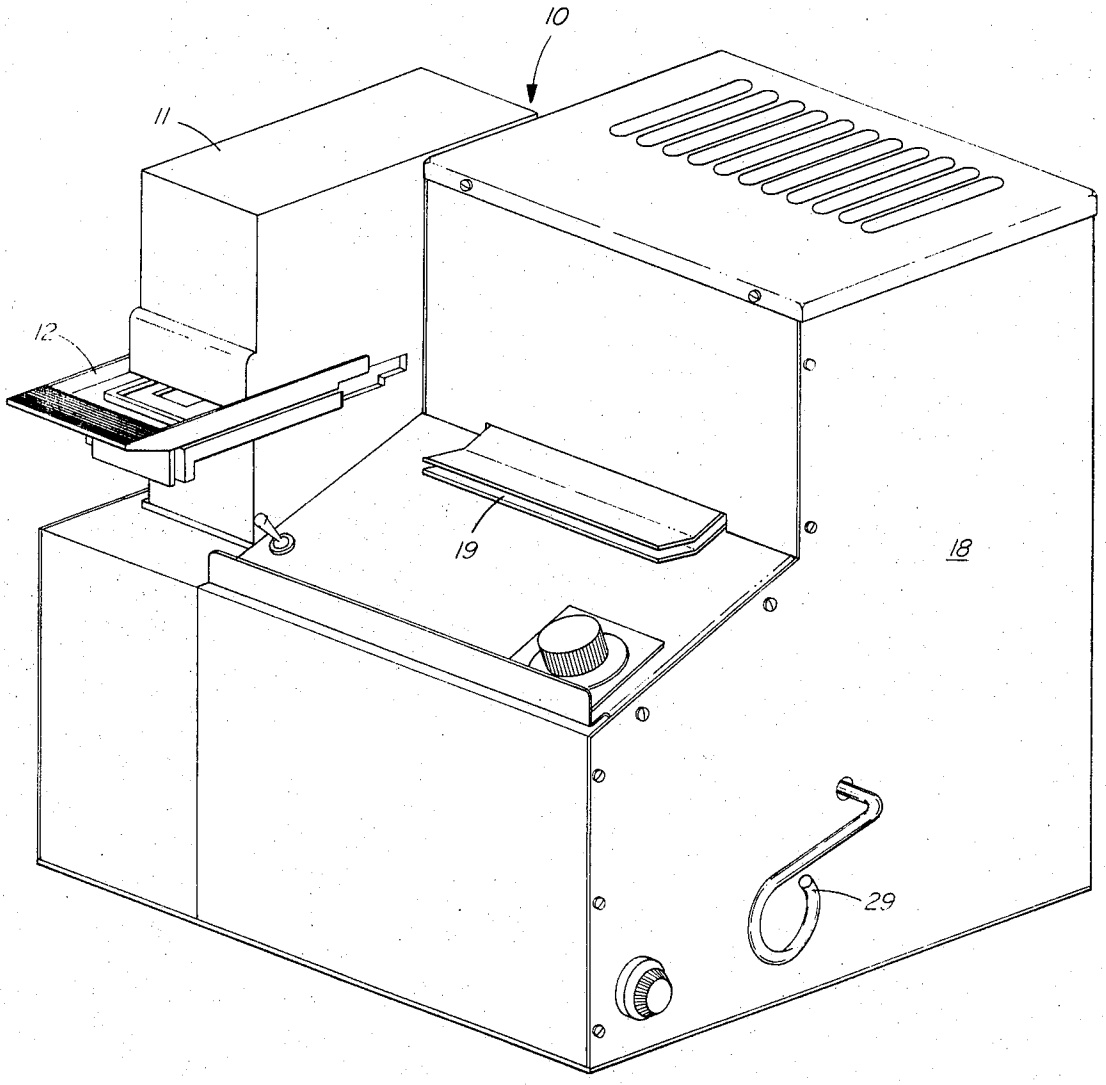

FIG. 2

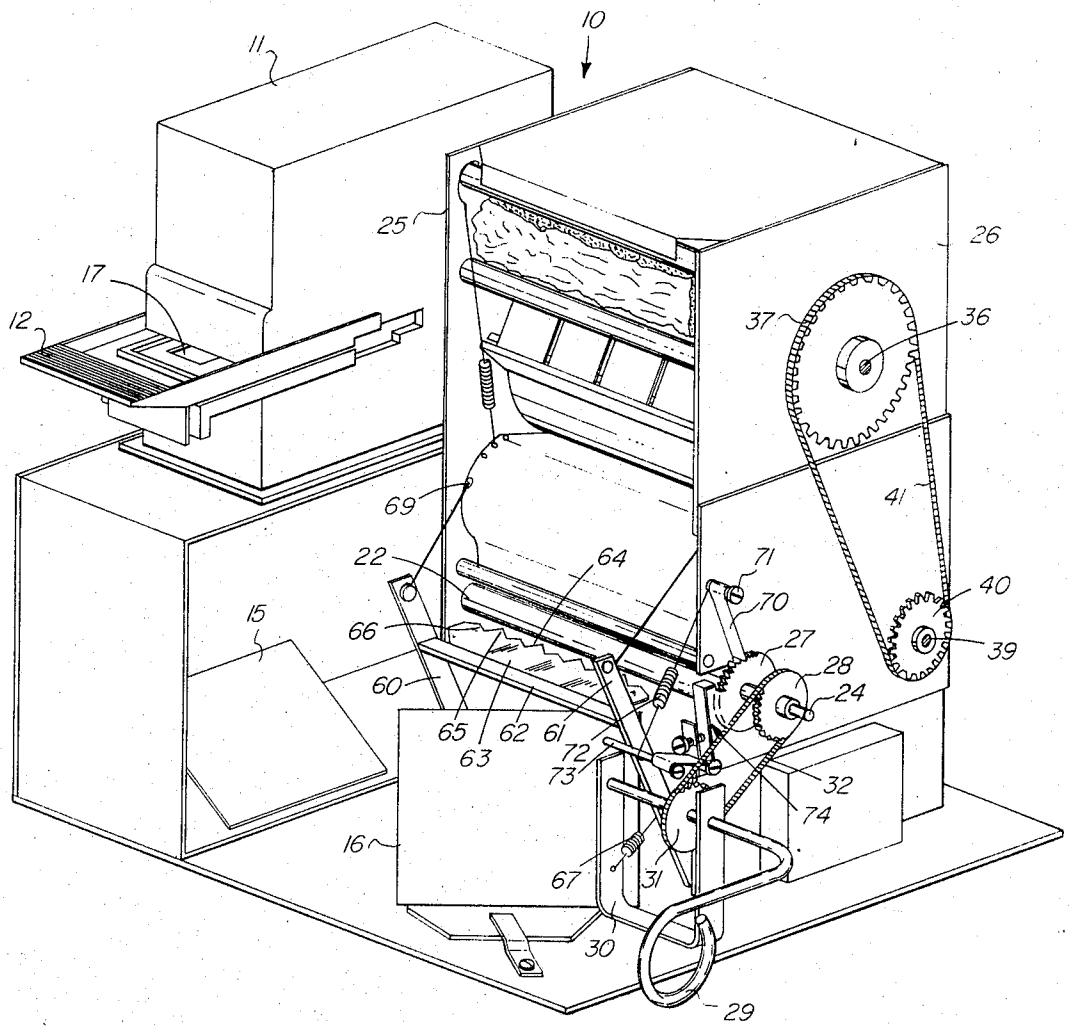
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FIG. 3

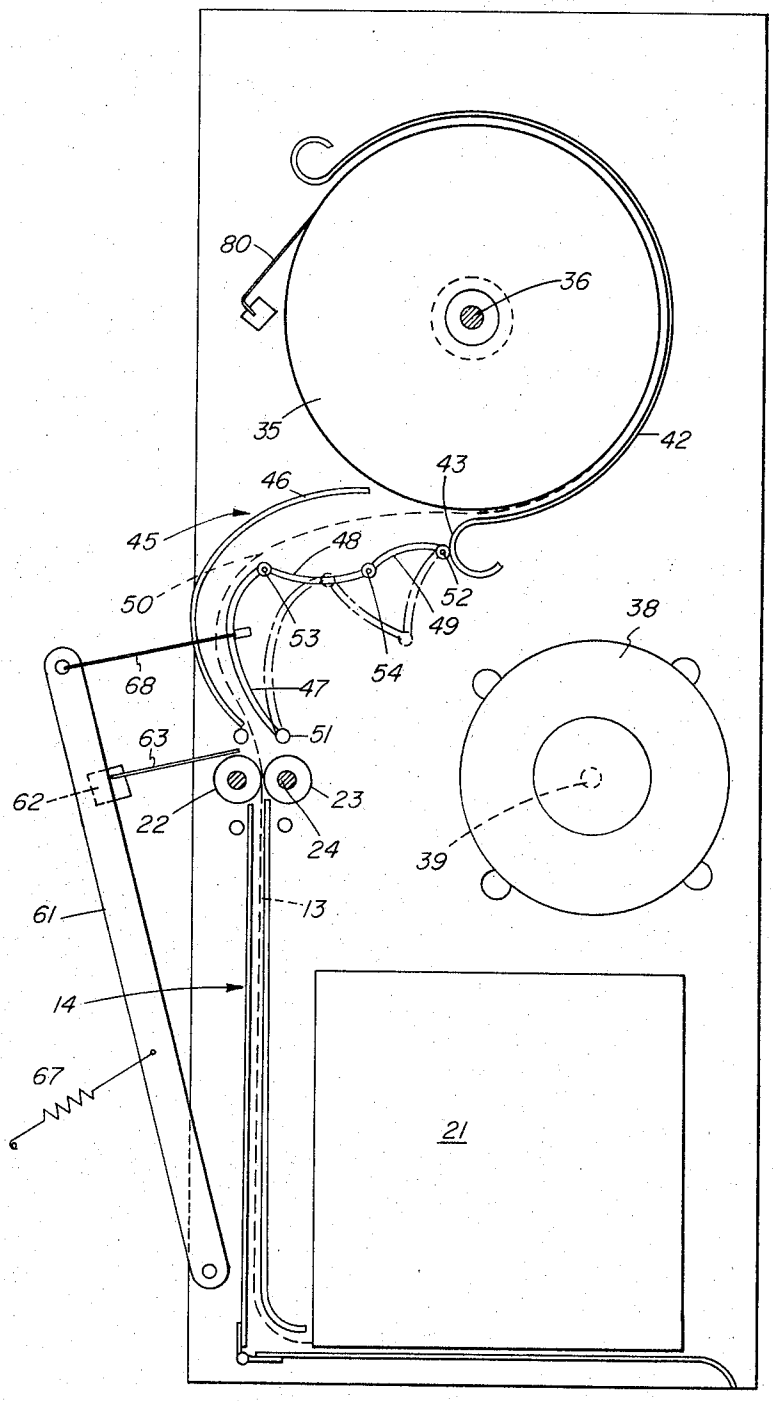
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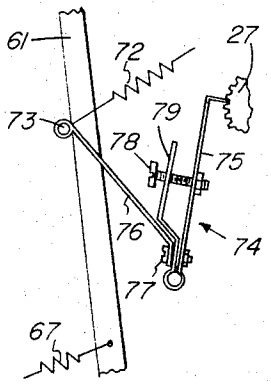
FIG. 4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SELF-ACTIVATING CUTTER FOR STRIP MATERIAL

FIELD OF THE INVENTION

The present invention relates to a mechanical device for cutting or severing an area or sheet from a continuous strip of material; and, more particularly, to such a device that is actuated intermittently by the continuous strip of material for cutting the strip into discrete sheets.

DESCRIPTION OF THE PRIOR ART

In a device for handling and cutting a continuous strip or web of material into discrete sheets, the material is usually provided with spaced indicia, such as edge notches, holes of a particular type and size arranged along an edge, the placement of a magnetic material in the form of stripes or marks at spaced intervals along an edge, etc., any one of which can be sensed by either mechanical or electrical means to provide an operating signal. This signal is usually used, after amplification, to initiate the operation of a cutting element, such as a blade or knife, located at some point past the sensing station, the strip of material being either stationary or moving during the actual cutting operation. These devices are of necessity quite complex, and with the required circuitry are relatively expensive to build and to maintain. In addition, such systems are not as versatile nor as economical as may be required for a particular type of cutting operation in which the size of the sheet is not critical. There is very definitely a need for a device which can be operated or actuated by the strip of material per se under conditions in which the strip of material is randomly advanced between at least two spaced stations and in which the strip of material controls directly the timing of the cutting operation.

SUMMARY OF THE INVENTION

It is one object of the invention to provide a device for cutting a strip of material in which the material per se actuates and controls actuation of the cutting element or blade.

It is another object of the invention to provide a device for cutting a strip of material that is dependent on the need to cut only when a predetermined condition exists relative to the strip of material.

It is yet another object of the invention to provide a device for cutting a strip of material that is moved through successive stations in a predetermined path and that is cut or severed while the strip of material is stationary relative to one station and continues to be moved through another of the stations.

It is still another object of the invention to provide a device for cutting a strip of material in which the cutting action is initiated by and only by the relative input and output rates of movement of the material and with respect to at least one of the stations through which the strip of material is to be moved.

These and other objects and advantages of the invention will be apparent to those skilled in the art by the description which follows.

The aforementioned objects of the invention are attained by a cutting or severing device that is disclosed in conjunction with a processing machine for heat development of latent images that are exposed successively on paper supplied in roll form. The strip of paper is moved from a supply roll through an exposure station to a pair of drive rolls. These rolls also move the strip of paper through suitable guide means to the surface of a rotating drum that is heated by a resiliently mounted shell that partially surrounds the drum. Normally, the leading edge of the strip of paper is between the drive rolls so that after an exposure, the drive rolls are rotated to advance the strip of paper into engagement with the drum. After the length of paper has been exposed and the exposed length has been moved past the drive rolls, the drive rolls, in effect, hold the strip of paper while the end of the paper in engagement with the drum continues to be moved by the drum between the drum and the shell, thereby shortening the path length between the drive rolls and the drum. The guide means through which the strip of paper is moved to engage the drum comprises a fixed member on one side of the strip and a number of sections on the other side of the strip that are pivotally interconnected so as to be movable to a collapsed position when the length of the strip of paper between the drive rolls and drum is shortened to a prescribed amount. A cutting blade is coupled to one of the movable sections of the guide means and upon movement into the collapsed position, the blade is moved toward and into engagement with the strip of paper at a point between the drive rolls and the end of the guide means adjacent thereto. With this arrangement, the cutting action takes place only when the drive rolls have ceased to advance the strip of paper and the path length between the drive rolls and the drum is shortened to such an extent that the paper per se actuates the guide means into the collapsed position, thereby operating the cutting blade.

While the invention is described in detail hereinafter with respect to a processing device for a photothermographic paper, those skilled in the art will realize that the same mechanism can be used in many devices for handling and cutting a continuous strip of material that can be moved through a path of predetermined configuration.

DESCRIPTION OF THE DRAWINGS

Reference is made to the accompanying drawings wherein like reference numerals designate like parts and wherein:

FIG. 1 is a perspective view of a processor for photothermographic material;

FIG. 2 is a perspective view similar to FIG. 1 with the front portion of the housing removed to show the operating relationship of the various elements comprising the invention;

FIG. 3 is a schematic side elevational view showing the path for the strip of material and the relation of the cutting means to the guide means and other elements of the processor; and

FIG. 4 is a detail view showing the mechanism by which the advancing means for the strip of material is held by the advancing rollers while the portion in contact with the drum is continued to be moved thereby.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention about to be described in detail hereinafter is disclosed in conjunction with a processor for a photothermographic material. Such a material is of the type disclosed in U.S. Pat. No. 3,457,075 issued July 22, 1969, in the name of Morgan et al and in U.S. Pat.

No. 3,672,904 issued July 27, 1972, in the name of DeMauriac. It is to be understood that the invention can be used in the same general manner as is described hereinafter for cutting other types of material in continuous strip or web form with the same result.

With reference to FIG. 1, the processor, generally designated by the numeral 10, comprises a housing 11 which contains a light source and a condenser lens system arranged relative to a film or slide carrier 12 which serves to move the film into and out of registry with the optical projection system in a well-known manner. A strip of photothermographic paper 13 is shown in FIG. 3 in relation to its path of movement and exposure station 14. The housing 11 also contains a projection lens and a mirror 15 which directs the image to a mirror 16 which, in turn, directs the image into the exposure station, as generally designated by the numeral 14 in FIG. 3. When the slide 12 is positioned outside of the housing 11, the film can be located on slide 12 and relative to the aperture 17 in slide 12. When the slide 12 is moved into housing 11, the film and aperture 17 are then aligned with the optical system of the projector. Casing 18 adjacent housing 11 encloses the processing portion of the apparatus and is provided with a discharge slot 19.

The strip of material or paper 13 is contained in roll form in a box or magazine 21 within casing 18. When a roll of paper is first placed in position, the leading end is directed through the exposure station 14 until it is engaged by a pair of resilient drive rolls 22 and 23. The drive roll 22 is freely rotatable and urged into engagement with roll 23 which is mounted on a shaft 24 journaled in the spaced side walls 25, 26 mounted within the casing 18. As seen in FIG. 2, the shaft 24 extends beyond wall 26 and casing 18 and has fixed thereto a ratchet 27 and a sprocket 28. An operating handle 29 extends to the outside of the casing 18 and is journaled within the casing in a bracket 30. The handle 29 carries a sprocket 31 that is interconnected to sprocket 28 by a chain 32. Hence, upon rotation of handle 29 in a clockwise direction, roll 23 is also rotated in a clockwise direction to advance the strip of paper 13 toward a heated drum 35. The aforementioned elements associated with drive rolls 22, 23, therefore, comprise means for advancing the strip of paper.

The drum 35 is rotatably mounted between walls 25 and 26 on a shaft 36 which also carries a sprocket 37 adjacent side wall 26. A motor 38 is mounted on the wall 26 and its drive shaft 39 carries a sprocket 40 that is interconnected to sprocket 37 by a chain 41 see FIG. 2.

THe drum 35 is provided with a shell 42 that is resiliently mounted with respect to the peripheral surface of the drum in a manner as disclosed in my U.S. Pat. No. 3,561,133 issued Feb. 9, 1971. Such a mounting permits a sheet of paper to be frictionally engaged to the extent that the drum can move the sheet relative to the shell. In this patent, the heating elements are disclosed as being mounted on the shell 42. However, the drum 35 per se can be heated by other means, such as heating elements contained within the drum, or by heat transfer from a source other than the shell 42 either within or without the drum.

Between the drive rollers 22, 23 and drum 35 and the end 43 of shell 42, guide means, generally designated by the numeral 45, for the strip of paper is arranged so as to direct the strip of paper into engagement with drum 35 and shell 42. Such guide means comprises a fixed member 46 on one side of the paper and a number of pivotally interconnected sections 47, 48 and 49 arranged relative to the other side of the paper. As shown in FIG. 3, the fixed member 46 is of such form and so arranged as to form a partial loop 50 of the strip of paper between rollers 22, 23 and drum 35. An end of section 47 is pivotally fixed at 51 and an end of section 49 is pivotally fixed at 52. Intermediate these two fixed pivots, the free ends of sections 47 and 49 are pivotally interconnected at 53 and 54 to the respective ends of section 48.

With the description thus far, it should be evident that the strip of paper or material 13 is advanced or moved through a predetermined path that is determined by the exposure station 14, drive rolls 22, 23 guide means 45 and drum 35 with shell 42. Since drive rolls 22, 23 are advanced manually, movement of the strip of paper can be terminated in accordance with a predetermined number of revolutions of the handle 29 in order to move the exposed area in the exposure station 14 beyond drive rolls 22, 23 for development of the latent image by drum 35.

The drum 35 is rotated continuously so that when the drive rolls cease to be rotated, the strip of paper 13 continues to be moved by drum 35 in cooperation with shell 42. Hence, the loop 50 between drive rolls 22, 23 and the entry end 43 adjacent the drum 35 and shell 42 is reduced in size until the strip of paper engages section 47. As the loop 50 continues to become smaller, the sections 47, 48 and 49 are moved eventually into a collapsed position as shown by the dotted lines in FIG. 3.

Means for cutting or severing the strip of paper 13 into discrete sheets comprises a pair of spaced members 60, 61 which are pivotally mounted on respective side walls 25, 26 and interconnected by a cross bar 62. The cross bar carries a cutting element or blade 63 that is provided with a serrated edge 64. This edge has adjacent pairs of cutting and piercing members 65 and 66. It will be noted in FIG. 2 that each pair of piercing members comprises one part or point 65 that extends ahead of the other 66, so as to pierce the strip of paper at spaced points along a line before any cutting action occurs. After piercing with a slight cutting action, the other set of piercing members engage the strip to continue the cutting action without tearing the paper. The members 60, 61 are spring-biased in a counterclockwise direction by springs 67, and each free end is interconnected by a link 68 to the section 47 of guide means 45. It will be noted in FIG. 3 that the links 68 pass through suitable apertures 69 in the fixed guide member 46.

In order to hold the drive rolls 22, 23 against rotation and further advancement of the strip of paper after the exposed area has been moved toward drum 35 and beyond rolls 22, 23, a mechanism, such as shown in FIG. 4, is utilized. First of all, the ratchet 27 is engaged by a pawl member 70 pivotally mounted on wall 26 at 71 for preventing retrograde movement of the handle 29. After handle 29 has made the required number of turns to move the exposed area beyond rolls 22, 23, the section 47 draws the blade 64 toward the strip of material 13 as the loop 50 decreases in size. A spring 72 arranged between the pivot 71 and an arm 73 maintains the arm against the member 61 as it is moved toward strip 13. With this movement, the bell-crank, desig-

nated generally by the numeral **74,** is also moved in a clockwise direction by spring **72.** This movement causes the pawl **75** to engage ratchet **27,** thereby preventing movement of handle **29** in either direction. With this locking of the handle **29** against movement, the drill rolls **22, 23** hold or clamp the strip of paper therebetween so as to permit full operation of the cutting blade **64.** The bell-crank **74** comprises the pawl member **75** and an arm **76,** the free end of arm **76** carrying the member **73** to which one end of the spring **72** is fixed. The arm **76** is made integral with pawl **75** by means of a screw **77.** The timing with respect to which the pawl **75** engages ratchet **27** can be adjusted by means of screw **78,** which is carried by the extension **79** formed integral with pawl **75.**

As the blade **63** is moved into engagement with the strip of paper, the points **65** will first engage the paper, penetrate it and then continue on through to form the first portion of the cut. After this, the points **66** will engage and penetrate the strip of paper and with further movement, the cutting action will be continued and finalized with the blade being moved completely through the strip of paper. Once the strip has been cut, the pressure that had been applied against section **47** to cause this movement into a collapsed position is removed and the spring **67** causes the sections to revert to their original position because of the connection between section **47** and link **68.** This rearward movement of the members **60, 61** and blade **64** also causes the pawl **75** to be disengaged from the ratchet **27,** thereby permitting another exposure to be made with subsequent movement of the exposed area into engagement with the drum **35.**

The sheet of material that has been cut from the strip is moved with drum **35** relative to shell **42.** The heat which is prevalent between drum **35** and shell **42** causes the latent image to be developed. The sheet is stripped from the drum by the pivotally mounted finger **80** and directed thereby into the discharge slot **19** shown in FIG. **1.**

This invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

I claim:

1. In a device for handling and cutting a continuous strip of material comprising means defining a predetermined path of movement for the strip of material from a supply source to a discharge slot, said means including a continuously rotating element arranged in the path upstream from the slot for advancing material into the slot and advancing means arranged in the path upstream from the element and adjustable between a holding condition in which it holds the material and an advancing condition in which it advances the material into engagement with the rotating element, the improvement comprising:

means arranged between the advancing means and the rotating element for guiding the strip of material through a loop to the element and including means for sensing a reduction in the size of the loop caused by continued rotation of the rotating element when the advancing means is in its holding condition;

means mounted between the advancing means and the adjacent one end of the guiding means and movable between an inoperative position and a position for engaging and cutting the strip of material transversely of its direction of movement; and

means responsive to said sensing means for moving the cutting means into the cutting position when the size of the loop of material is reduced.

2. In a device for handling and cutting a continuous strip of material comprising means defining a predetermined path of movement for the strip of material from a supply source to a discharge slot, said means including a continuously rotating element arranged in the path upstream from the slot and means arranged in the path upstream from the rotating element and engaging the strip of material for advancing the latter into engagement with the rotating element, the improvement comprising:

means arranged between the advancing means and the rotating element for guiding the strip of material to the rotating element and having a part thereof movable into a generally collapsed position by a decrease in the length of the strip of material between the advancing means and the rotating element;

means mounted between the advancing means and the guiding means and movable between an inoperative position and a position for cutting the strip of material transversely of its direction of movement; and

means coupling the movable part of the guiding means to the cutting means for moving the latter into the cutting position, when the strip of material is held by the advancing means and at least the leading edge thereof is in contact with the peripheral surface of the rotating element for continued movement thereby, whereby the reduction in length of the strip of material within the guiding means causes the movable part to move the cutting means so as to cut the strip of material.

3. The device in accordance with claim **2** wherein the rotating element comprises a drum and a resiliently biased member extending partially around the drum for maintaining the strip of material in contact with the drum while being advanced thereby.

4. The device in accordance with claim **2** wherein the guiding means comprises a fixed member on one side of the strip of material and extending between the advancing means and the peripheral surface of the rotating element and a movable member on the other side of the strip of material comprising a number of pivotally interconnected sections movable into the collapsed position.

5. The device in accordance with claim **2** wherein the cutting means comprises a pivotal support and a cutting blade carried by the support.

6. The device in accordance with claim **5** wherein the coupling means comprises at least one link member interconnecting the pivotal support to one of the interconnected sections.

7. The device in accordance with claim **2** including means actuated by the cutting means upon movement into the cutting position for engaging and holding the advancing means against movement.

8. In a device for handling and cutting a continuous strip of photothermographic material comprising means defining a path of movement for the strip of material from a supply source, through an exposure station and a processing station to a discharge slot, said means including a continuously rotatable drum ar-

ranged between the exposure station and the discharge slot and means arranged between the exposure station and the drum for advancing an exposed area of the strip of material to move the area out of the exposure station and into engagement with the drum and for holding the strip of material when the trailing edge of the exposed area has been advanced past the advancing means, the improvement comprising:

means arranged between the advancing means and the drum for guiding the strip of material into engagement with the peripheral surface of the drum and comprising a rigid, fixed member and a number of intermediate sections forming with the fixed member a passageway through which the strip of material is moved, the sections being movable into a collapsed position by the strip of material as the latter is held by the advancing means and is continued to be moved by the drum to effectively decrease the length of the strip of material between the advancing means and the drum;

means mounted between the advancing means and the end of the guiding means and movable between an inoperative position and a position for cutting the strip of material transversely of its direction of movement; and

linkage means coupling one of the intermediate sections and the cutting means for moving the latter into the cutting position as the sections move into the collapsed position, thereby separating the exposed area from the strip of material.

9. The device in accordance with claim **8** wherein the sections are interconnected for pivotal movement away from the fixed member with the continuous decrease in the length of the strip of material in the passageway.

10. The device in accordance with claim **8** wherein the cutting means includes a blade having a toothed edge for penetrating the strip of material prior to cutting thereof.

11. The device in accordance with claim **10** wherein the blade is provided with a number of pairs of adjacent teeth, each pair of teeth having one tooth that engages the strip of material to effect a partial cutting before engagement of the strip of material by the other tooth.

12. The device in accordance with claim **8** wherein the linkage means comprises a pair of spaced link members, each link member having one end fixed to the cutting means and the other end providing a lost-motion connection with one of the sections.

13. The device in accordance with claim **8** wherein the intermediate sections comprise three in number, the first section having one end pivotally fixed adjacent the advancing means, the third section having one end pivotally fixed adjacent the drum, and the second section being pivotally connected at its ends to the free ends of the first and third section, whereby the sections are foldable relative to each other in the collapsed position.

14. The device in accordance with claim **13** wherein the linkage means couples the cutting means to the first section of the guiding means.

15. The device in accordance with claim **8** including means actuated by the cutting means upon movement into the cutting position for engaging and holding the advancing means against movement.

16. The device in accordance with claim **15** wherein the cutting means is resiliently biased into the inoperative position wherein it maintains the guiding means in its uncollapsed position and the engaging and holding means in a position disengaged from the advancing means.

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