Dec. 12, 1939. N. R. JONES ET AL 2,182,871

MATERIAL CUTTER AND STACKER

Filed March 26, 1937 2 Sheets-Sheet 1

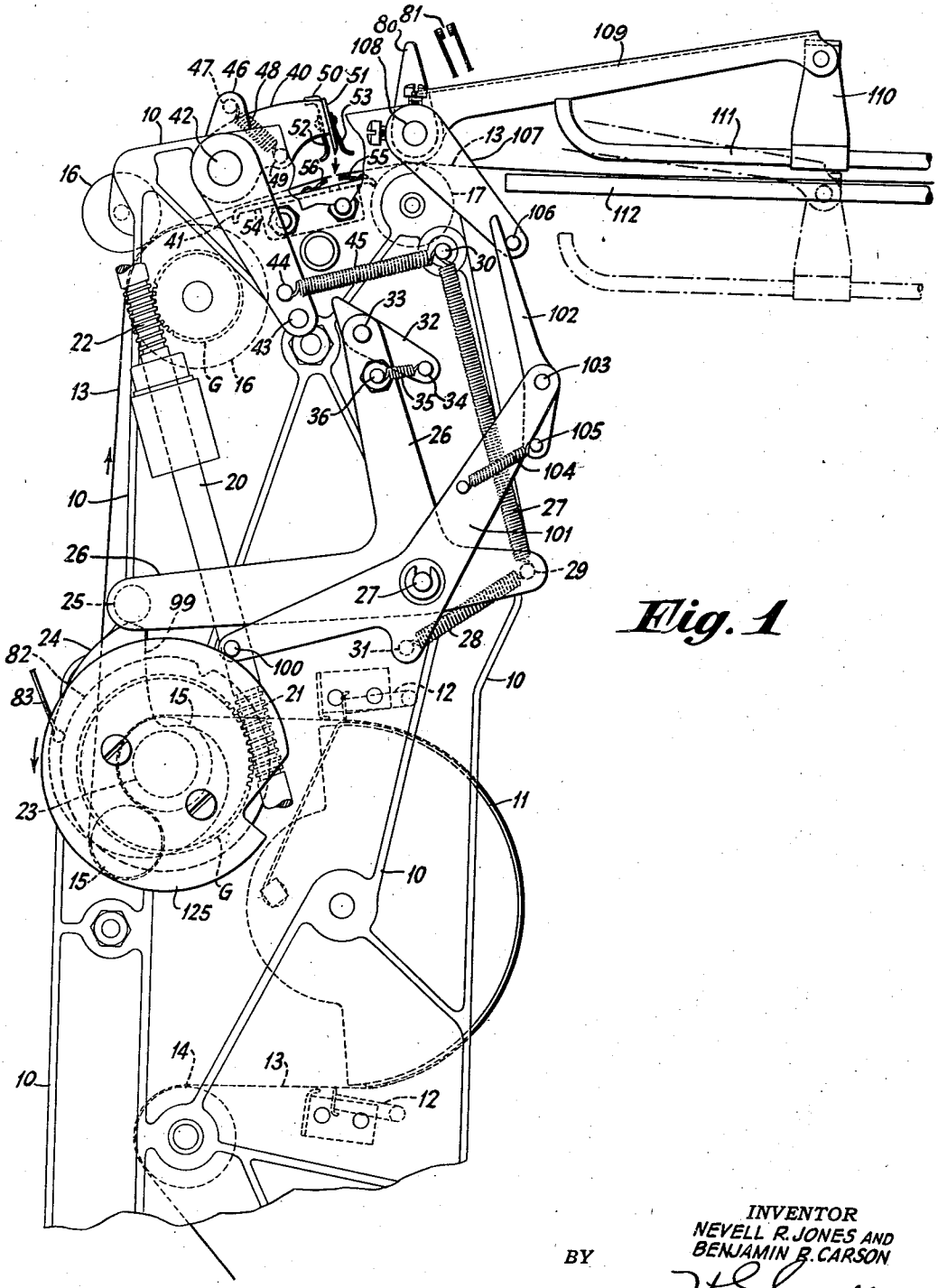


Fig. 1

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Fig. 3

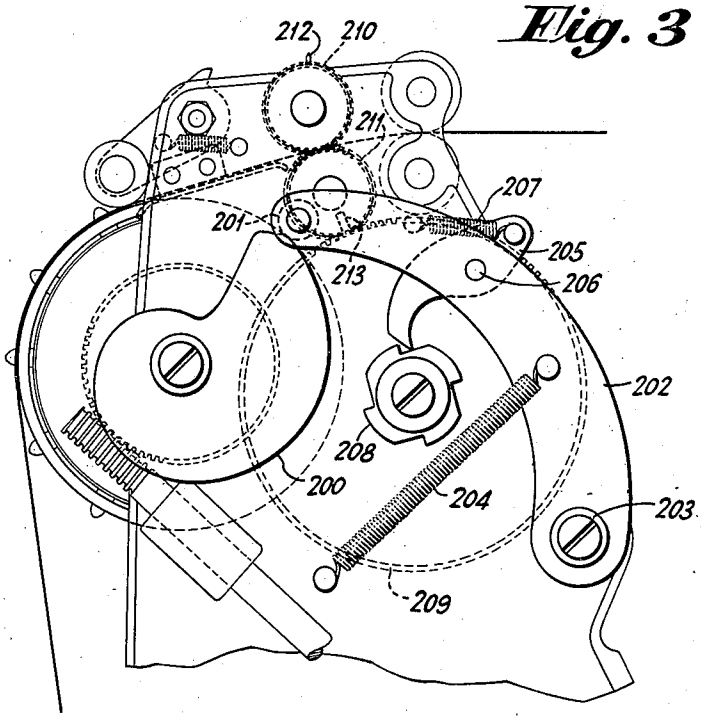
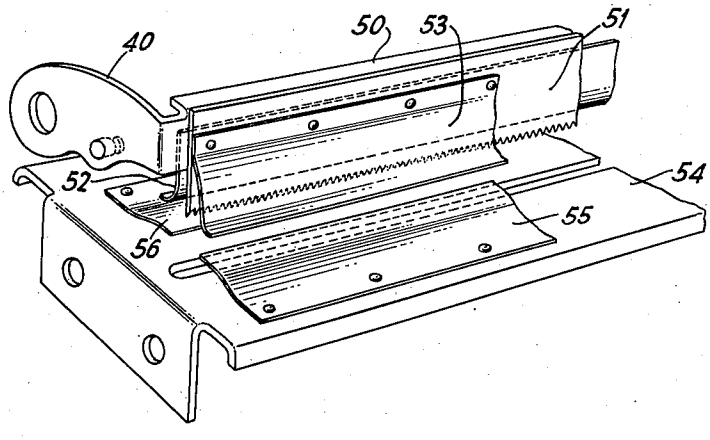


Fig. 2



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MATERIAL CUTTER AND STACKER

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Application March 26, 1937, Serial No. 133,137

5 Claims. (Cl. 164—42)

This invention relates to cutting and stacking apparatus as usually related to sheet material, and more particularly to cutting and stacking apparatus as applied to photoradio or facsimile machines.

Such machines are well known at the present time in their broader concepts, and this apparatus has been particularly useful for use with the so-called Young facsimile receiver as illustrated in United States Patent Re. 20,152, granted to C. J. Young. The Young machine in its broadest concept comprises a receiver drum with a helical section mounted on the periphery thereof, the drum rotating in synchronism with a transmitter drum. The transmitter picks up line by line electrical impulses representative of the optical density value along each line, and these impulses are transmitted to the receiver where they actuate a striker or presser mechanism which is located immediately adjacent the elongated spiral or helix on the receiver drum. The recording material has in general been paper although, of course, other recording mediums may be used. A sheet of carbon paper is maintained in intimate relationship with the recording material along a line tangential to the receiver drum and these two materials pass together between the receiver drum and the striker or presser bar or bars so that impulses which actuate the bar or bars leave a deposit of elemental size on the recording material at the point where the striker or presser bar or bars is forced against the raised helix. As this application is not concerned particularly with the operating details of this portion of the machine, for a more complete understanding, reference should be had to the Young Patent Re. 20,152, hereinbefore referred to.

It is within the contemplation of present day facsimile practice that a portion of the expense attached to the transmission of such material may be borne by advertising. Accordingly, the side of the sheet recording material on which the intelligence which is transmitted is not recorded, that is to say the back of the material, may be printed with advertising matter which is properly arranged with respect to each sheet of transmitted material; that is to say, for instance, if the normal size of the picture or intelligence which is to be transmitted is of the order of say 11" or 12" in length, then when the sheet is cut from the roll of material on which the intelligence is recorded, the advertising matter should be in correct alignment with the recorded material. As the advertising matter would be printed prior to the placing of the blank roll of recording material in the machine, naturally not only must the recording be synchronous as set forth in application Serial No. 133,135, filed March 26, 1937, but the action of the cutting device must be definitely related to the action of the machine.

Again, it is customary to feed the recording material through the machine by means of friction rollers, and the material is ordinarily passed between one set of these rollers, thence past the cutter apparatus to another set of rollers, thus being suspended for a portion of its travel in this direction. It has been found that with ordinary cutting mechanisms, there has been a tendency on the part of the paper to bow, or tend to pull the paper through the rollers or even tear. The latter two effects are, of course, prohibitive for this type of work, and accordingly our cutting mechanism has been invented to overcome amongst other defects this particular problem since absolute synchronous operation of the paper or the recording material is necessary.

The material has in general been passed on to some form of collecting or supporting apparatus after it has been cut into sheets. The most desirable form of support has in general consisted of two cylindrical bars of nominal diameter spaced apart with regard to each other and hence comprising a divided support for the sheet. The bars have been maintained at an angle with respect to each other so that at or near one portion of their length the sheet material was narrower than the spacing of the bars, and hence would fall between the bars into a collecting pan or tray. Difficulty arose due to the fact that the paper had a tendency to become electrostatically charged during its passage through the machine and across the bars, and as a result tending to freeze against the bars or curl, and my stacking mechanism has been so arranged that this problem is overcome.

It is also within the contemplation of those skilled in this particular art that the average user of this machine may very easily forget and leave the machine running for a time which under certain circumstances might be undesirable. Therefore, we provide in conjunction with the stacking mechanism a means which will automatically shut off the machine when the amount of material which has been piled in the stacking tray has reached a predeterminable value.

Accordingly, the objects of our invention are to provide a cutting apparatus which will operate synchronously with respect to the facsimile machine to efficiently and cleanly grip and cut the sheet material into lengths.

It is also an object of our invention to provide a stacking mechanism which will neatly and effectively stack the sheets of recorded material, and it is a still further object of our invention to provide a device which will automatically render the machine inoperative when the amount of material collected in the collecting tray has reached a predeterminable value.

Our invention will best be understood by reference to the drawings in which

Fig. 1 shows one form of cutting and stacking means as applied to a facsimile receiver,

Fig. 2 is a perspective of the cutter used in Fig. 1, and

Fig. 3 is an alternative cutting mechanism.

Referring to Fig. 1, there is shown the details of one form of cutting apparatus and the stacking apparatus and their relative arrangement with respect to the rest of the machine. It should be borne in mind that these drawings are not to scale but are drawn purely for the purpose of showing the inventive concept and correlation of parts. The facsimile receiver frame 10 is skeleton-like in nature and a portion of the supporting framework is indicated by this numeral. Supported by the frame is a driving motor (not shown for purposes of clarity) which is adapted to drive the various rotating parts of the apparatus. The recording drum 11 is driven by the driving motor, and supported in intimate relationship thereto are the presser or striker bars 12. The recording material 13 is passed across the periphery of roller 14 to the periphery of drum 11, and thence over friction drive rollers 15 to the friction drive rollers 16, thence past the cutting mechanism to friction rollers 17. The carbon material has not been shown since it is fed merely by means of drive rollers from the roll, thence into intimate relationship with the recording paper at the recording drum and then is re-rolled, and this apparatus as claimed does not concern either the movement of nor the disposal of the carbon paper. The driving motor drives a shaft 20 which is appropriately mounted in bearing members and contains at various portions 21 and 22 worm arrangements which are adapted to drive or cause to rotate friction roller 16 and the shaft 23 with the correct relative speeds each to the other. Mounted on shaft 23 are two cam members 24 and 125 with appropriate slots cut into their periphery. In riding relationship with cam 24, which will be explained hereinafter as a cutter cam 24, is a cam rider 25 mounted on a crank arm 26 which is pivoted at 27. This crank arm is a substantially T-shaped member with one side of the T stricken with respect to the other two lines thereof. Joined to the T-shaped crank arm 26 are springs 27 and 28 which are joined together at a common retaining member 29. The other end of spring 27 is engaged to the frame of the device at 30 while the opposite end of spring 28 is joined at 31 to another crank arm which will be more fully hereinafter explained, and it will be referred to as the stacker crank arm.

The leg of the substantially T-shaped cutter crank lever which is substantially at right angles to the section on which is mounted the cam rider 25, has joined in pivotal relationship at the extremity of this section a bar 32 pivoted at 33. Joined to the bar 32 at the position 34 is a spring member 35 whose opposite end is fastened to the member 26 at the position 36. This bar has been cut diagonally across its face so that when in its normally retained position, the cut edge of the bar is substantially in parallel with the arm of the member 26 with which it is pivotally engaged.

Also mounted in the framework of the machine is an L-shaped arm consisting as here shown in two sections 40 and 41, and at the joint of these sections this arm is pivotally supported at 42. One end of the crank arm is a member 43 which protrudes from the face of the arm and whose function will be more fully hereinafter explained. Joined to the arm 41 at a position 44 which is slightly above the member 43 is a spring 45, the other end of which is fastened at the position 30. Joined to the framework of the device is a member 46 having a protruding portion 47 to which is joined one end of a spring member 48 whose other end is joined to the L-shaped member 40 at the point 49. It will be appreciated that while the sections 40 and 41 have been described as an L-shaped crank, in reality the section 40 may comprise two portions joined together by a rather lengthy bar section, as will be more fully illustrated in Fig. 3. The function of the arm 41 is naturally to cause the movement of both of these members 40 which are joined together by the bar-shaped member, and it will be more fully understood by reference to Fig. 3. The bar member joining the two arms 40 is illustrated at 50 and fastened onto this bar member is a serrated knife or cutter blade 51 and a pair of resilient members 52 and 53. Also mounted on the framework of the machine is an apertured supporting plate 54 having thereon two resilient members 55 and 56. It will be noted that the path of the paper 13 is across this supporting plate 54 and over the resilient members 55 and 56 and separates these latter members from the knife blade 51 and the resilient members 52 and 53. The action of the cutter is as follows: As has been stated hereinbefore, the cutter cam 24 is mounted in driven relationship to the driving motor of the device and also in time driven relationship to the friction rollers which feed the recording paper through the machine at a definite rate. Therefore, the cam 24 will rotate one complete revolution for each definite amount of progress of the paper through the machine. It is selected in this machine that the paper shall progress the length of one sheet in a time of approximately twelve minutes. Therefore, the cam 24 is adjusted to make one complete revolution every twelve minutes. This, of course, is a matter of choice and not one of restriction. Now, the cam rider will be normally retained on the face of the machine at a position so that the position of the arm 26 with respect to the arm 41 is out of intimate or closed engagement. Now, as the cam rotates, as is indicated in a counterclockwise direction, this being signified by the arrow, the rider will approach the face of the slot in the cam, this face being indicated as 99. Upon reaching the edge of the slot, the rider will drop suddenly with what would amount to a lunge due to the action of the spring 27 which is normally held stretched by the position of the rider 25 on the face of the cam 24. When this happens, the T-shaped cutter crank 26 will rapidly tilt about the axis 27 and the member 32 fastened to 26 will, with the face that is substantially parallel to the arm on which it is mounted, strike the protruding member 43 mounted on crank arm 41 with a comparatively great force. When this happens, the arm 41 will revolve about the axis 42 and the pin member 43 will describe an arcuate path until it is out of engagement with the member 32, and the latter will pass by to the

other side of the pin 43. As a result of the force of the blow imparted by the member 32 to the pin 43, the cutter knife 51 which is mounted on the arm 40 and which is normally retained in a position out of engagement with the paper by the spring 48 will be forced downwardly toward the aperture in the supporting plate 54. However, it will be noted from the diagram that the resilient members 52 and 53, one of each is located on either side of the cutter knife, will reach the paper before the knife blade itself. There they will come into a forced relationship with the two resilient members 55 and 56 so that the paper is tightly held over the aperture which is formed between the two resilient members 55 and 56. Due to their resiliency, the two members 52 and 53 will spread out in a direction parallel to the supporting plate 54 and the knife blade 51 will then pass through and sever the paper. Thus, it will be seen that the paper is held firmly in a non-bowing and a non-slipping manner before the knife blade actually cuts it.

At the bottom of the slot in cam 24, the cam face begins to curve with a rapidly changing radius of curvature so that, gradually, the crank 26 is forced upwardly again by means of the rider 25, and gradually stretching the spring 27 until it again reaches the position shown in the diagram. As the motion of the cutter arm itself and cutter blade is comparatively quick, and the arm 40 is pulled backward into position by means of spring 48 rather rapidly, the member 32 must then re-engage with the pin 43 on its return stroke, its return being much more slow to the position shown than is that on which the arm 43 is mounted. Hence, some means must be provided for allowing the member 32 to slide by the pin 43. It will be noted that the member 32 is pivotally mounted at 33 and is normally held in the position shown by the spring 35. However, on its return path the member 32 will be revolved about its axis 33 due to the force of the then steady pin 43 and it will be forced downwardly until the arm 26 passes by the arm 41. Then due to the action of the spring 35, the member 32 will again assume the position shown in the drawings. A stop device limits the movement of the member 32 in its retentive position as determined by the spring 35. Thus, it will be seen that a quick, accurate cutting of the paper takes place.

It will be noted that there is a cam rider 100 in co-operative relationship with the periphery of the stacker cam 125. This rider is joined near the end of one of the faces of an elbow crank arm 101 which is pivotally mounted near the elbow section at 27. Joined at the point 31 on the elbow is a spring member 28, the other end of which is joined at 29 to the cutter crank arm 26. At the end of the elbow crank 101, which is opposite from that on which is mounted the cam rider 100, is an arm member 102 which is pivotally mounted at 103. At the end of the shorter section of the arm 102 is fastened a spring member 104 to a stop member 105 which limits the motion of the arm. The other end of the spring is joined to the crank arm 101. Near the end of the arm 102, which is opposite to the end at which the spring member 104 is fastened, there is located immediately adjacent the narrow face of arm 102 a stop or detent pin 106. This latter pin is joined to a crank arm 107 which is rotatably mounted at 108. The arm 107 is fastened to another arm 109 which is adapted to rotate therewith about the axis 108. At the extremity of the arm 109 is a floating arrangement comprising a pivotally mounted support member 110 which will assume a substantially vertical position, and held thereby are two arm members 111, one of which is shown in this view. The arms 111 are normally retained adjacent the support rods 112 which have hereinbefore been referred to and which comprise normally two cylindrical rods of nominal diameter placed at an angle each with respect to the other so that near the extremity the spacing between the two is greater than the width of the recording material.

The action of the stacking device is as follows: It will have been noted that the slot cut in the periphery of cam 125 is in advance of the position of the slot cut in the periphery of the cam 24. The reason for this is that the recording material must travel a fair distance after it has been cut before it may be stacked and, of course, this timing may be made by the positioning of the controlling slots in the two cams referred to. When the cam 125 rotates to such a position that the cam rider 100 gets to the edge of the slot contained therein, upon a small turning of the cam, the arm 101 will plunge into the slot due to the action of spring 28. When this is done the arm 102 is drawn out of supporting relationship with respect to detent 106 and withdraws a considerable distance therefrom. When this withdrawal takes place, the unit consisting of arms 107, 109, 110, and 111 will, due to gravity, rotate about axis 108, thus giving the paper a short push downwardly through the bars 112 and into the stacker tray. The position of this member when it drops is shown in dotted form. The downward motion is however limited since the backward motion of the crank arm 101 is not comparatively great and, therefore, the detent pin 106 will come sharply into contact with the arm 102. Since this arm is held by a spring 104, it will act as a resilient buffer, and also as the rider 100 moves upwardly out of the slot in the cam 125, the detent will be pushed upwardly again in a comparatively short time, thus rotating arm 107 about the axis 108 and withdrawing the bars 111 from contact with the paper.

Referring to Fig. 2, there is shown the details of the cutting knife arrangement. One of the arms 40, which was axially joined with the arm 41 and whose motion was adapted to be controlled thereby, is shown and the cross arm joining the two members is also shown, it being understood that this arrangement is the same on both sides. For purposes of simplicity and clarity, only one of the arms 40 has been shown, and it has been customary and convenient to form both the two arms 40 and the cross arm or supporting arm arrangement 50 of the same piece of material. Fastened to the cross arm 50 is the knife blade 51 which has a serrated edge, and joined to one side of the cross arm 50 is the resilient member 52, and fastened to the knife blade and extending thereacross is the other resilient member 53, a portion of which has been cut away for purposes of showing the detail better. In the path of the outer swing of the cutter knife is the apertured supporting plate 54 to which is joined the two resilient members 55 and 56. The action of the cutter arm has been explained hereinbefore, and briefly it may be stated again that as the arms 40 swing downwardly, the paper which passes between the two sets of resilient members 55, 56 and the other set of resilient members 52, 53 is first firmly gripped and held in stretched position by the resilient mem-

bers themselves, and then the knife blade continues its downward stroke due to the resiliency and consequent spreading of these members and severs the paper cleanly.

Referring to Fig. 3, there is shown an alternative cutter arrangement. The cutter cam, in this instance, **200** has in riding relationship with it a cam rider **201** which is joined to an arcuate lever arm member **202** which is pivoted at its opposite extremity from the rider at the point **203**. Joined to the arm **202** between the rider and the pivot point is a spring **204**. Also joined to the arcuate arm is a ratchet **205** which is pivoted at the bearing **206** to the arcuate arm. Also joined to the ratchet is a spring **207**. Co-operatively positioned with respect to the ratchet bar **205** is a toothed pawl **208**. The pawl is rigidly mounted with respect to gear **209**, and this gear joins the geared rollers **210** and **211**. The knife blade **212** is joined to roller **210** and a slot **213** is cut in the periphery of roller **211**. The paper is fed between these rollers in its passage forward.

The action of this device is as follows: When the cam rider comes into a position opposite the slot in cam **200**, it will lunge downwardly due to the action of spring **204**, and the ratchet bar **205** will push the pawl a quarter of a revolution, the gear relationships between gears **209**, **210** and **211**, the latter two of which are equal, is such that for a quarter of a revolution of the pawl the gears **210** and **211** make one complete revolution. Thus, the knife blade is brought around into contact with the paper and passes through the paper into the slot **213** as it revolves, thus severing the paper and assuming the position shown in the drawing.

It has been hereinbefore stated that one of the objects of this invention was to provide a device which, when the recording material had been stacked to a predeterminable height, the machine would automatically shut off so as to obviate continuous running of the machine when the material is not removed. For this purpose, there is provided on the same shaft as is the member **107**, an elliptically shaped cam **80** and, adjacent thereto are two electrical contacts **81**. Also on the shaft on which is mounted the two cams **24** and **125** is mounted a third cam **82** having a relatively small slot cut in its face, and appurtenant thereto is a rider and arm **83**, the latter being so mounted that it will not drop into the cam slot when the slot comes opposite it but will merely engage with the face of the cam as the face rotates opposite it.

The action of this arrangement is as follows: Normally, the slot in cam **82** will come opposite the contacter **83**, which incidentally forms an electrical switch with the cam at a time when the dropper, whose arm is indicated at **109**, is being actuated. The contacts closed by the elliptical cam form a switch which is joined in parallel to the switch arrangement formed by the cam **82** and the rider and arm **83**. Now, as a result, during normal operation of the machine the contacts **81** remain open, and at the time when the slot in **82** comes opposite the rider, the electric motor energizing circuit would be broken but for the fact that its parallel switch arrangement which comprise the contacts **81** are forced upwardly into contact with each other by the elongated edge of the elliptical cam forcing against the contacts. These contacts close when the dropper is almost completing its upward swing and, in actual practice, the slot in the cam **82** comes opposite the rider on arm **83** at a time when the dropper is at the bottom of its stroke. Now, where the material is normally removed from the tray, the downward swing of the dropper is sufficiently great to close the contacts **81**. However, as the material piles up in the tray, the downward swing of the dropper is limited and, accordingly, one of the contacts **81** is not forced upwardly by the elliptical cam quite enough to join with the other contact, and as the slot in cam **82** comes opposite the contact on arm **83**, this switch is also broken and the motor circuit is de-energized, whereas normally with the arm taking its full drop, one of these two switches is closed at all times and it is only when both remain open that the motor stops. This will, of course, depend on the downward swing of the dropper and is entirely predeterminable and, therefore, can be set for any desired amount of paper stacked in the stacking tray.

What we claim is:

1. A material cutting apparatus comprising a first lever arm, means for applying a stress to said lever arm to turn said arm about its fulcrum, means for normally opposing said stress, said means acting in timed relationship to the passage of said material to release the opposing stress intermittently, a second lever arm in the path of but mechanically disconnected from said first lever arm, a detent mounted on said second lever arm, a resiliently held member mounted on said first lever arm for engaging said detent and exerting an actuating force thereon during one direction of motion of said first lever arm, a knife blade mounted so as to respond to movement of said second lever arm, and means for actuating said knife blade when the opposing stress is removed from the first lever arm.

2. A material cutting apparatus comprising a first lever arm, means for applying a stress to said lever arm to turn said arm about its fulcrum, means for normally opposing said stress, said means acting in timed relationship to the passage of said material to release the opposing stress intermittently, a second lever arm in the path of but mechanically disconnected from said first lever arm, a detent mounted on said second lever arm, a pivotally mounted arm mounted on said first lever arm resiliently held in its normal position and adapted to exert an actuating force on said detent in one direction of motion of said first lever arm, a knife blade mounted so as to respond to movement of said second lever arm, and means for actuating said knife blade when the opposing stress is removed from the first lever arm.

3. A material cutting apparatus comprising a cam having a cam slot therein, a pivotally mounted first lever arm, a cam rider mounted on said first lever arm and adapted to follow the peripheral contour of said cam, resilient means for holding the cam rider in intimate relationship with said cam periphery with considerable force, said latter means tending to turn said first lever arm about its fulcrum, a second lever arm pivotally mounted and mechanically disconnected from said lever arm, a knife blade mounted so as to follow the motion of said second lever arm, a detent mounted on said second lever, a member pivotally mounted on said first lever arm and adapted to be brought into engagement with said detent for exerting an actuating force on said detent in one direction of motion of said first lever arm, and a spring for holding said member in a position so as to engage with said detent in accordance with movement of said first lever arm.

4. A material cutting apparatus comprising a

first lever arm, means for applying a stress to said lever arm to turn said arm about its fulcrum, means for normally opposing said stress, said means acting in timed relationship to the passage of said material to release the opposing stress intermittently, a second lever arm, a detent mounted on said second lever arm, a resiliently held member mounted on said first lever arm for engaging said detent and exerting an actuating force thereon during one direction of motion of said first lever arm, a knife blade mounted so as to respond to movement of said second lever arm, an apertured supporting base plate for said material, resilient means mounted on said base plate, resilient means mounted adjacent said knife blade, said plurality of resilient means being adapted to firmly engage the material therebetween immediately prior to severing of the material by the knife blade, and means for actuating said knife blade when the opposing stress is removed from the first lever arm.

5. A material cutting apparatus comprising a first lever arm, means for applying a stress to said lever arm to turn said arm about its fulcrum, means for normally opposing said stress, said means acting in timed relationship to the passage of said material to release the opposing stress intermittently, a second lever arm, a detent mounted on said second lever arm, a pivotally mounted arm mounted on said first lever arm resiliently held in its normal position for exerting an actuating force on said detent in one direction of motion of said first lever arm, a knife blade mounted so as to respond to movement of said second lever arm, an apertured supporting base plate for said material, resilient means mounted on said base plate, resilient means mounted adjacent said knife blade, said plurality of resilient means being adapted to firmly engage the material therebetween immediately prior to severing of the material by the knife blade, and means for actuating said knife blade when the opposing stress is removed from the first lever arm.

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