Sept. 22, 1953 M. G. JONES 2,653,024

DEVICE FOR FEEDING, CUTTING, AND STACKING CONTINUOUS WEBS OR BANDS

Filed March 21, 1951 4 Sheets-Sheet 1

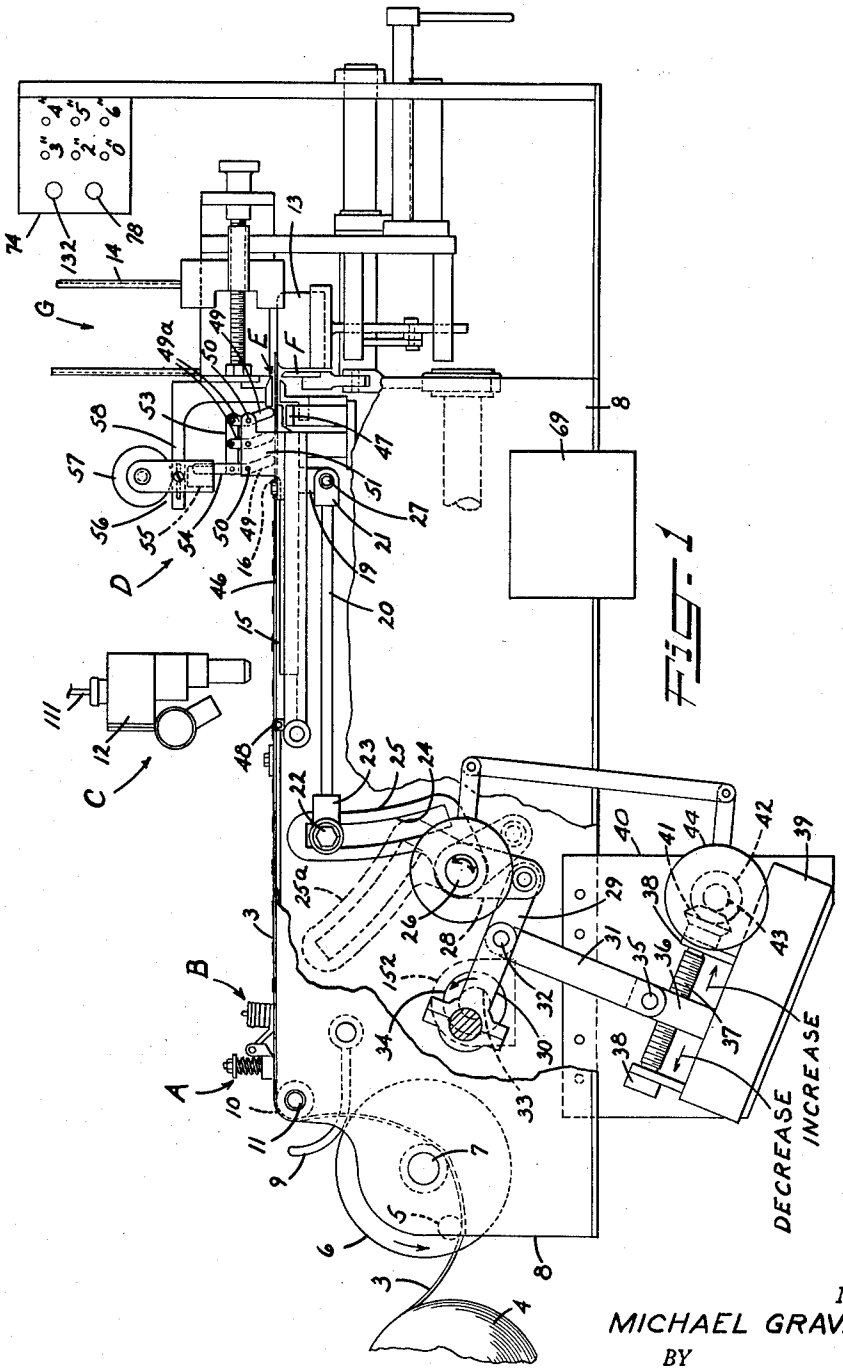


FIG. 1

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Filed March 21, 1951 4 Sheets-Sheet 2

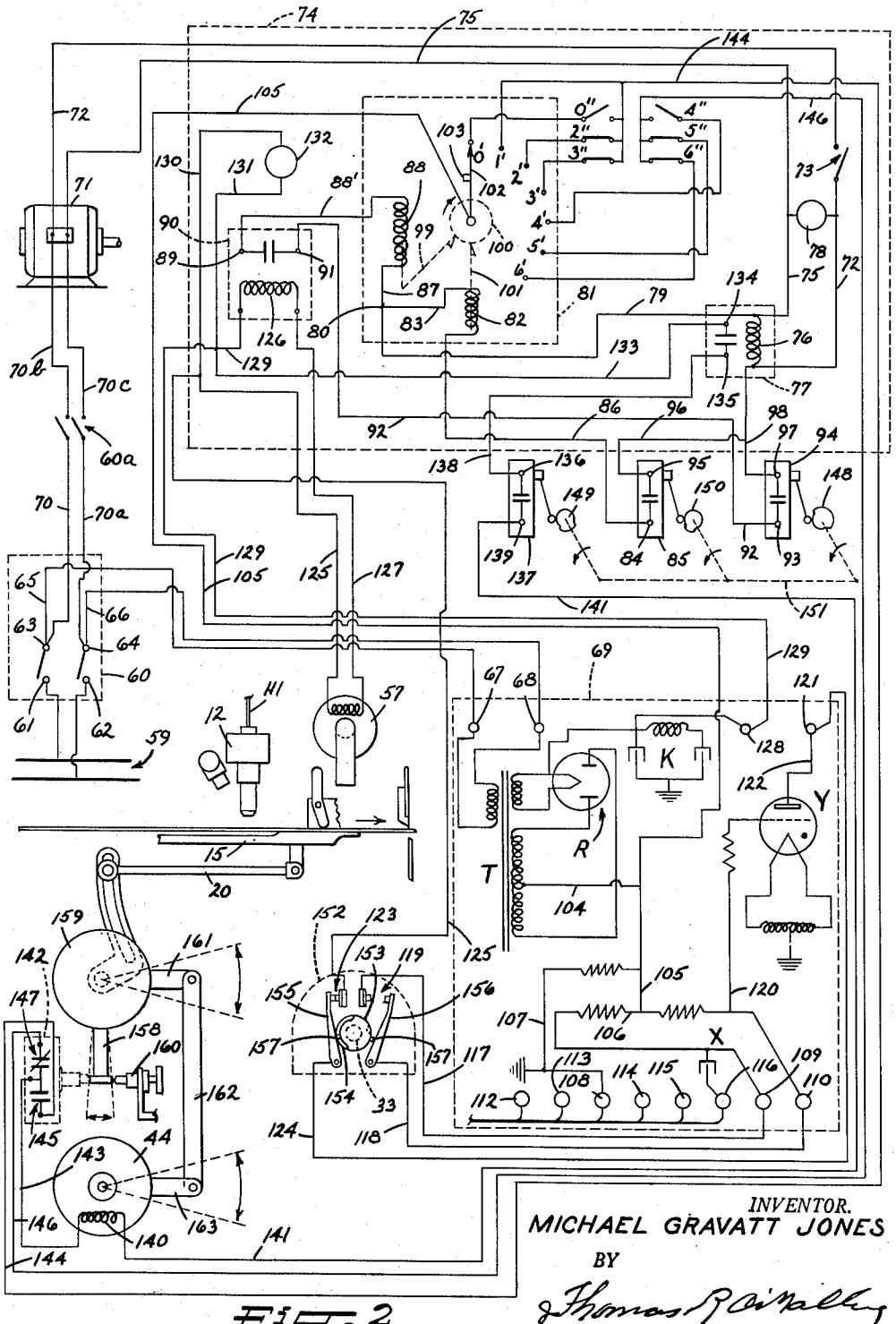


Fig. 2

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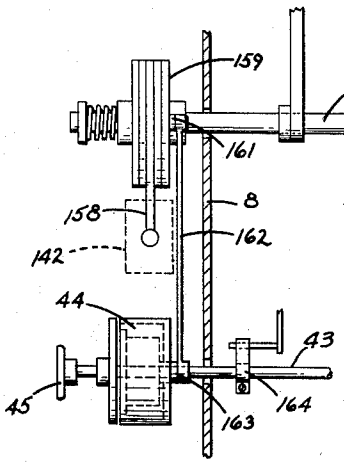


Fig. 3

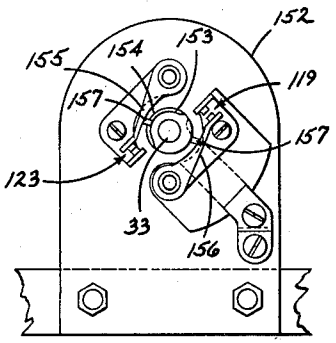


Fig. 4

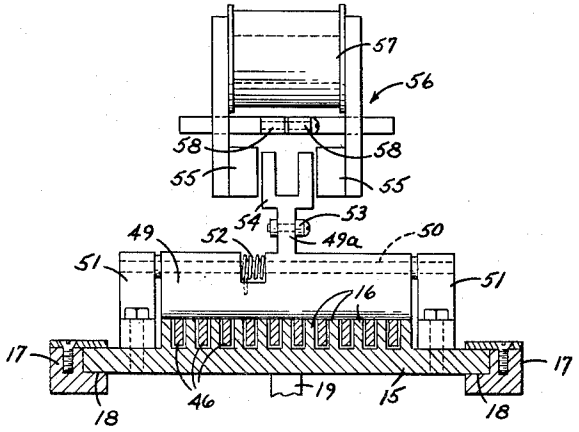


Fig. 5

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DEVICE FOR FEEDING, CUTTING, AND STACKING CONTINUOUS WEBS OR BANDS

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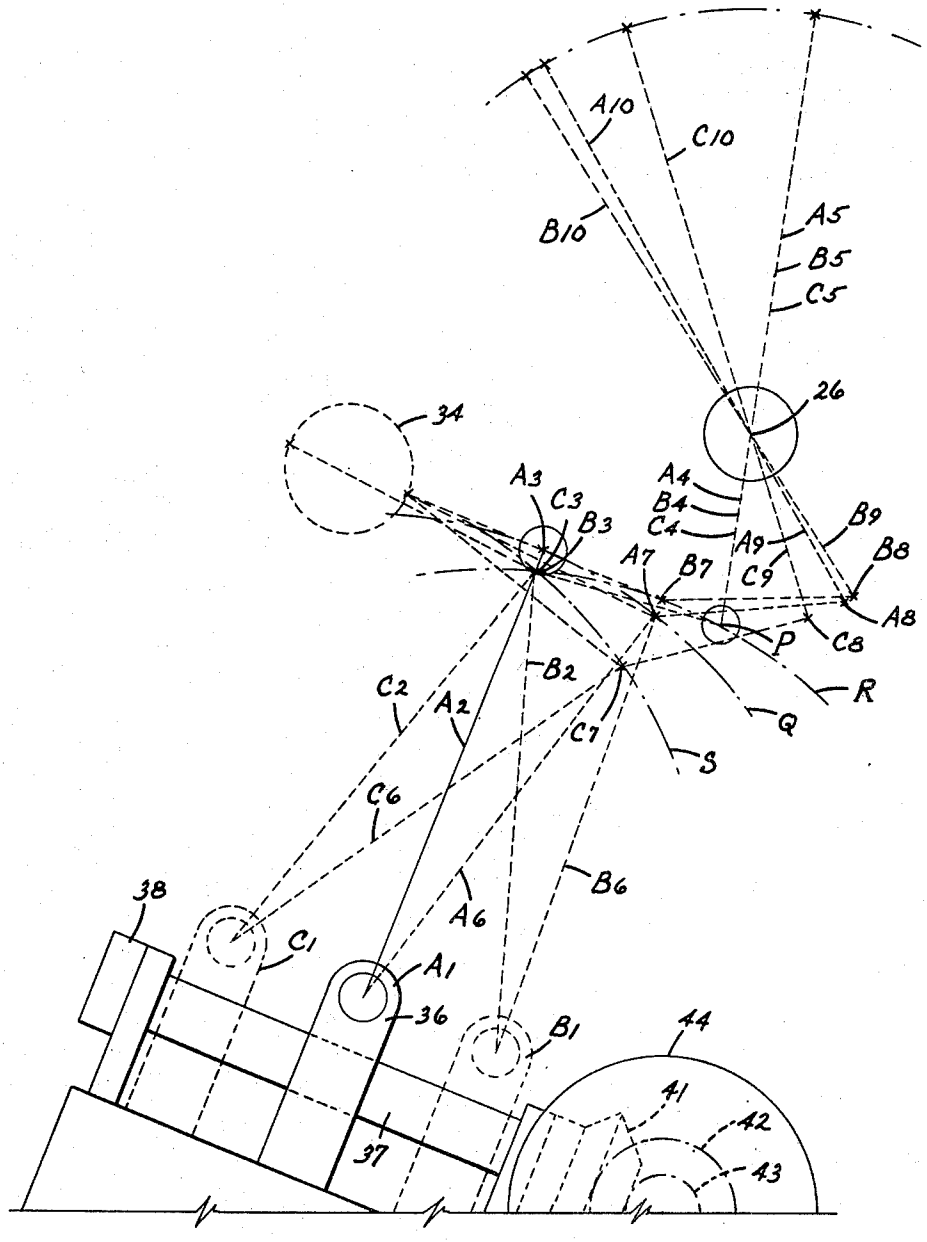


Fig. 6

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UNITED STATES PATENT OFFICE

2,653,024

DEVICE FOR FEEDING, CUTTING, AND STACKING CONTINUOUS WEBS OR BANDS

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Application March 21, 1951, Serial No. 216,818

14 Claims. (Cl. 271—2.6)

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This invention relates to an improved device for intermittently feeding a web or band to a cutting position, repeatedly cutting the band and stacking the pieces to facilitate packing. In particular, the invention is concerned with an improved feed regulating means whereby a substantially uniform portion of the continuous web or band is intermittently fed to a cutting position. The invention is further concerned with producing a device for feeding, cutting and stacking a continuous web or band, the feeding means of which is automatically controlled and adjusted without interruption of operation of the machine, such as by an electronic feed controlling and adjusting mechanism actuated by a light-responsive device such as a photocell.

This application relates to the apparatus forming the subject matter of copending application Serial No. 99,464, filed June 16, 1949, in which there is shown and described a mechanism for feeding, cutting and stacking a continuous printed web or band. Briefly, the operation of the mechanism therein described is as follows: the web or band, carrying the repeated indicia or pattern thereon, is wound on a reel rotatably mounted on one end of the machine. The web material is fed into the machine or proceeds from the reel about a withdrawing roll, which is rotatably mounted eccentrically on a rotating disc, then through a clamp which holds the web and prevents withdrawing of the web back out of the machine when the withdrawing roll is removing the web from the reel. In the machine, the web passes under a light-responsive device, such as a photocell, in contact with a horizontally reciprocating feeding means which intermittently introduces the web to a cutter and the cut portions are thereafter stacked, all of these operations taking place sequentially and periodically.

The photocell determines the point at which the band is to be cut and energizes a magnet periodically to shorten the stroke of the feeding means which is normally set to overfeed slightly. Irrespective of the length of the stroke of the feeding means, its forward motion is always terminated at the same point, namely the cutter. The feeding means comprises pivotal fingers which grasp the web and move it forward and merely slide over the web on their return. An armature on the feeding fingers passes between the poles of the magnet, which when energized by an impulse received from the photocell, retard the forward motion of the armature causing the fingers to pivot and thus lift up from the web and stop the feeding thereof. This results in a shorter portion of the web material passing under the cutter to be severed.

Since the machine is originally adjusted to overfeed the stroke shortening means may not be able to keep up with the overfeeding, and therefore the stroke of the feeding means should be

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readjusted. A hand-operated means is provided to shorten or lengthen the feeding stroke by changing the leverage on the driving connections to the web feeding means. This adjustment is possible while the machine is in operation.

The above-described machine functions satisfactorily but it requires close scrutiny on the part of the operator to watch that the overfeed does become so great or rather that the point of cutting does not deviate too far from the desired point on the band or web which requires adjustment of the stroke of the feeding means by the hand-operated means above described. At the same time, the operator must remove the bands from the stacker at regular intervals, inspect them and then pack them. Further, when the tolerance of deviation in size of the cut bands is small, for example, one millimeter, it is practically impossible for one operator to watch feeding and cutting of the bands and remove the bands from the stacker, inspect and pack them at the same time. Employing more than one operator with each machine naturally increases the cost of manufacture and increases it to a point that is commercially impractical. Hence, there has been a need to develop some means by which the feeding means of a band feeding, cutting and stacking machine could be continuously controlled and adjusted automatically during operation of the machine thus enabling the operator to attend solely to removing the cut bands from the stacker, inspecting and packing them.

It is an object of the present invention to overcome the aforementioned difficulties and provide an apparatus for feeding, cutting and stacking a continuous web or band having an automatic feed-controlling and adjusting means attached thereto. It is another object of the invention to provide a feed controlling and adjusting means which operates continuously at predetermined time intervals during operation of the machine. It is another object of the invention to provide an electronically controlled automatic feed-controlling and adjusting means for an apparatus for feeding, cutting and stacking a continuous web or band having repeated indicia or patterns thereon. It is a further object of the invention to provide an electronically controlled automatic feed-controlling and adjusting means of such construction that the entire variation in the length of the feeding stroke is effected without substantially changing the forward point of the feeding stroke. Other objects of the invention will be apparent from the drawing and description thereof hereinafter.

For a better understanding of the following description of the invention, reference should be had to the accompanying drawing, which is merely intended to be illustrative and not limitative and in which

Figure 1 is a side elevation of the machine

partly cut away to show the driving connections for the feeding means and the stroke adjusting means,

Figure 2 is a diagrammatic view of the electrical connections and electronic circuit,

Figure 3 is an end view of the mechanism for rotating the stroke-adjuster shaft,

Figure 4 is an end view of the cam and switch control,

Figure 5 is a section on line I—I of Figure 1, and

Fig. 6 is a diagrammatic layout showing the various positions of the stroke adjusting linkage.

Referring to Figure 1, the band or web 3 proceeds from the reel 4 about a roll 5 rotatably mounted eccentrically on a disc 6 secured to shaft 7 for rotation therewith. As shown, the reel 4 is mounted on the upright machine frame member 8. However, the reel may be mounted in a tank positioned adjacent the machine when, as in the case of regenerated cellulose band material made from viscose, it is desirable to cut the band material while wet so the cut bands may be immediately packed for shipment. The web or band then passes upwardly between guides 9 and over the roll 10 fixedly mounted on a cross-shaft 11 rotatable in bearings on the machine frame. From the roll 10, the web or band passes under a clamp generally indicated at A, under a tensioning rider indicated at B, under a light-detecting system generally indicated at C, then into the intermittent feeding mechanism generally indicated at D, then between the clamping jaws at E, through the cutter at F and into the stacker generally indicated at G.

In general, the operation of the apparatus shown in Figure 1 is as follows: the web or band material 3 is drawn from the rotatable reel 4 by the action of the withdrawing roll 5 which makes a planetary motion around the axis of shaft 7. This drawing motion from the reel takes place while the clamp at A holds the web to prevent withdrawing it back out of the machine. After the drawing action of roll 5 is completed for a given cycle, the clamps A and E release the web and it is apparent that there will be slack material between the roll 10 and reel 4 so that the feeding mechanism at D, which now enters its forward feeding strokes, does not act to rotate the reel 4. The feeding mechanism takes up only part of the slack between 10 and 4 during the forward stroke. The light-responsive system at C is preset in readiness for operation near the end of the forward feeding stroke of D so that it may then receive an impulse from the change in light-reflecting or transmitting characteristics of the web caused by the passage of the predetermined index mark or pattern elements printed on the web into the field of view of the photocell or photo-scanning head 12, which passage indicates the need for correction in the stroke of the feeding mechanism D. Such impulse received by the scanning head is amplified and conducted through an electronic circuit connected to which are various means for adjusting the stroke of the feeding mechanism. These various stroke-adjusting and controlling means, as well as the electrical and electronic circuits, are described in detail hereinafter.

At the completion of the forward feeding stroke, clamps A and E are actuated to hold the web in position and the knife F is moved upwardly to cut the protruding section 3a of the web. Immediately following this, the block 13 lifts the cut sections into the bottom of the magazine 14 of the stacker G. This operation is repeated indefinitely and the operator may remove the stacked sections from the magazine at any time desired.

Various parts of the machine shown in Figure 1, such as clamps A and E, etc., and referred to in the above general description, are shown diagrammatically since a detailed showing and description of the same is not essential to a thorough understanding of the present invention. For a detailed illustration and description of such parts or members, reference should be had to the copending application hereinabove referred to, namely Serial No. 99,464. The present invention is primarily concerned with the intermittent feeding means in that it provides an automatic means for lengthening or shortening the feeding stroke to correct or readjust the same while the machine is in operation.

Referring to Figures 1 and 5, the intermittent feeding mechanism generally indicated at D comprises a reciprocable bottom plate 15 having a plurality of upwardly projecting parallel ribs 16 extending lengthwise of the direction of feed. Spaced rails 17 having opposed grooves 18 serve as guides for the edges of plate 15 and a depending lug 19 is connected to a link 20 by means of a yoke 21. The other end of the link 20 is secured to a pin 22 by a fitting 23 rotatable on the pin. The other end of pin 22 is adjustably secured in the slot 24 of the lever 25 which is fixedly secured to the rocker shaft 26. The slot 24 is designed to provide a fixed forward position of the feeding mechanism regardless of stroke length. That is, slot 24 forms an arc about the center of pin 27 extending through yoke 21 and lug 19 when the feeding mechanism is in its most forward position, as shown in Figure 1. Therefore, shifting the connection of rod 20 in the slot 24 will not change the forward position of the feeding mechanism, but it will change the length of the stroke of the feeding mechanism by changing the return position of the mechanism. The connection of rod 20 in slot 24 is shifted to the desired position at the start of operation which will give a feeding stroke slightly greater in length than the length of the individual band to be cut. The slight overfeed may vary up to .005 to .01 inch. Thereafter, the position of rod 20 in slot 24 need not be changed until a different size band is to be cut. Preferably, the position of rod 20 should not be set to underfeed slightly at the start since the forward position of the feeding stroke is substantially fixed, and while the feeding stroke can be automatically increased during operation, as hereinafter explained, more satisfactory results are obtained if the correction is in the stroke-shortening direction.

The shaft 26 is oscillated by a lever 28 which is pivotally connected to a link 29 which in turn is pivotally connected to a crank rod 30. Both the link 29 and crank rod 30 are pivotally connected with a link 31 at 32. The crank rod 30 is mounted eccentric with crank shaft 33 on the disc 34 which is keyed to the shaft 33. Link 31 is pivotally connected at 35 to a follower 36 which has a threaded bore engaging the screw shaft 37. The screw shaft 37 is mounted on the supporting brackets 38 in an inclined position, the brackets 38 being mounted on the bracket 39 fastened to the machine frame 40. The inclination of screw shaft 37 should be such that

when the feeding mechanism is in its most forward position, as shown, link 31 will form a right angle with both the link 29 and crank rod 30 when the follower 36 is in the center position on screw shaft 37, as shown in Figure 1.

The lower end of screw shaft 37 is provided with a bevel gear 41 which meshes with bevel gear 42 fixedly mounted on shaft 43 which extends through the side of the machine and carries a magnetic clutch 44 and a hand-wheel 45 (see Figure 3). As hereinafter explained, shaft 43 is the stroke-adjuster shaft.

As shown in Figures 1 and 5, a plurality of parallel stationary guide bars 46 are disposed between the ribs 16 extending upwardly from the reciprocating bottom plate 15 of the feeding mechanism generally indicated at D. The guide bars 46 are secured to a horizontal cross piece 47 at one end and a cross rod 48 at the other. These guide bars form a bed for the web or band to pass over as it is drawn by the feeding mechanism.

A plurality of gripping members 49 are pivotally supported by cross-shafts 50 between the brackets 51 mounted on the reciprocating plate 15. The gripping members as shown are plate-like members, the lower edges of which extend across the surface formed by the ribs 16 and the guide bars 46. The gripping members may be notched, if desired, to form a series of fingers positioned above the ribs 16. The cross-pieces 50 have springs 52 wound thereabout (see Figure 5) which serve to hold the gripping members down against the band or web 3. The gripping members 49 have lugs 49a extending upwardly from the centers thereof which are pivotally connected to a cross bar 53. As shown in Figure 1, there are three gripping members 49. The trailing gripping member in the direction of feeding has an armature 54 extending up from its lug 49a and integrally attached thereto. During the feeding operation, the armature passes back and forth between the depending poles 55 of an electromagnet 56 comprising a coil 57 and being adjustably mounted on the brackets 58.

The electromagnet acts as a stroke-correction means. When the magnet is energized, as hereinafter described, and this is only done while plate 15 and the gripping members 49 are moving forward in a feeding direction, the armature 54, upon reaching the center of the magnet poles 55, is retarded in its forward motion thus causing the gripping members 49 to pivot on cross-shafts 50 out of contact with the band or web 3. The position of the magnet is so adjusted that this action takes place just before the completion of the forward or feeding stroke thus in effect shortening the feeding stroke since once the gripping members are out of contact with the band it remains stationary.

The operation of the various parts of the feeding mechanism and the controlling and adjusting means associated therewith will be described in detail with the description of Figure 2 which illustrates the electronic circuit of the invention. Suffice it to say, however, when screw shaft 37 is rotated so as to move the follower 36 toward the end of the shaft to which bevel gear 41 is attached, the length of the stroke of rod 20 will be increased by reason of the fact that lever 25 will return to a position beyond the dotted line position 25a of lever 25 shown in Figures 1 and 6. Dotted line position 25a is the end of the return stroke when follower 36 is intermediate the brackets 38 as shown. Conversely, when the follower 36 is moved up the screw shaft 37 away from bevel gear 41 and beyond the intermediate point shown, the stroke of rod 20 will be decreased since the lever 25 will not reach the dotted line position 25a upon the completion of the return stroke. With the construction and disposition of the parts herein described, it requires a considerable movement of follower 36 along shaft 37 before an appreciable shift occurs in the forward point of the feed plate 15. By restricting the length of shaft 37, the shift, if any, in the forward point of the feed plate is negligible and it is safe to say that no correction in the length of the feeding stroke is made in the forward direction. However, very small movements of the follower 36 from the position shown cause definite movement of the rearmost point of the feed plate stroke. This system is sufficiently sensitive, however, to continually adjust the length of the feed stroke during operation with the result that the cut bands will only deviate from the predetermined size by as little as one millimeter.

Figure 6 shows on an enlarged scale the action of the stroke adjusting mechanism described above. The center position of follower 36 is indicated at A^1 and in this position the centerline of link 31 is indicated at A^2. The center of the pivot pin 32 connecting link 29 and crank rod 30 is shown at A^3 and the center of the pin connecting lever 28 and link 29 is shown at P. In this position the line A^4 represents diagrammatically the position of lever 28, and for clarity the centerline of lever 28 has been extended in a straight line through the center of shaft 26, but the positions of lever 25 and the other associated parts correspond to the showing of Fig. 1. The position of lever 25 corresponding to the position A^4 of lever 28 is shown at A^5 and it will be seen subsequently that the positions A^4 and A^5 coincide for the maximum forward positions of levers 28 and 25 regardless of the adjustment of follower 36. With the follower 36 in the same central position A^1 but with the crankshaft or disc 34 turned approximately 180°, the relative moved positions of link 31, pin 32, the center of the pin connecting lever 28 and link 29, lever 28, and lever 25 are shown at A^6, A^7, A^8, A^9, A^{10}, respectively. It will be noted that the pin 32 swings through an arc designated by the construction line Q. With the follower 36 moved to the maximum adjusted position nearest gear 41 as shown at B^1, the two extreme positions of link 31 are indicated as follows. In the rear link position, the link is shown at B^2 the center of pin 32 at B^3, the center of the pin connecting link 29 and lever 28 at P, the position of lever 28 at B^4 and the position of lever 25 at B^5. With the follower 36 in position B^1 but with link 31 at the opposite end of its stroke caused by approximately a half turn of disc 34, the position of link 31 is indicated at B^6. This places pin 32 at B^7, the center of the pin connecting lever 28 and link 29 at B^8, the position of lever 28 at B^9 and the position of lever 25 at B^{10}. It will be apparent that in the position last described, the maximum stroke is obtained since there is the greatest angular distance between positions B^5 and B^{10}. With the follower 36 in the opposite extreme adjusted position shown at C^1, link 31 on the forward stroke of lever 25 has the position shown at C^2, the center of pin 32 is located at C^3, the center of the pin connecting lever 28 and link 29 is located at P, and the position of levers 28 and 25 are shown at C^4 and C^5 respectively which coincide with the positions of these levers as described above. In the opposite extreme position of link 31 with

the follower at C^1, link 31 will be at C^6, pin 32 at C^7, and the center of the pin connecting lever 28 and link 29 at C^8. Lever 28 will be at C^9 and lever 25 will be at the position marked C^{10}. The arc described by the center of pin 32 when the follower 36 is in the position B^1 is shown at R and the arc described by the center of pin 32 when the follower is in the position C^1 is shown at S. It will thus be clear that regardless of the position of follower 36 on the screw 37, the variable linkage is such that lever 25 always returns to the same forward position shown at A^5 or B^5 or C^5. However, the rear position of lever 25 can be adjusted for a minimum stroke as shown at C^{10} or a maximum stroke as shown at B^{10}.

Figure 2 shows the electronic circuit employed in the present invention and it is set up as follows: a 115-v. A. C. power supply 59 is employed and the lead lines therefrom connected to the switch 60 at terminals 61 and 62. Terminals 63 and 64 of switch 60 are connected by lines 65 and 66 to terminals 67 and 68 respectively on the photoelectric panel 69, which as shown in Figure 1 is mounted on the machine frame below the feeding mechanism D. The terminals 67 and 68 are connected to a transformer which is shown at T. Line 70 is connected between terminal 63 of switch 60 and the motor starter switch 60*a* and line 70*a* is connected between terminal 64 of switch 60 and the motor starter switch 60*a*. Lines 70*b* and 70*c* connect switch 60*a* with motor 71. Line 72 is connected between motor 71 and switch 73 on the control box 74 mounted on the machine frame adjacent the stacker G.

Connected to motor 71 is a line 75 which is connected at its other end to one side of the coil 76 of the relay 77 in the control box 74. A pilot lamp 78 is positioned on the outside of the control box 74 and is connected to lead lines 72 and 75. The lamp burns when the switch 73 is closed to indicate the automatic adjusting mechanism is in operation. A lead line 79 is connected to the same side of coil 76 as line 75 and at its other end to the terminal 80 in the stepping relay 81 also located in the box 74. Terminal 80 is connected to the solenoid 82 by line 83, and the solenoid is connected to the terminal 84 of the reset switch 85 by line 86. A line 87 connects terminal 80 with the solenoid 88 which in turn is connected by line 89' to the switch terminal 89 in relay 90 located in box 74. The other terminal 91 of the normally open switch in relay 90 is connected by line 92 to the terminal 93 of reference switch 94. Terminal 95 of reset switch 85 is connected to the coil 76 in relay 77 by line 96 and terminal 97 in reference switch 94 is connected to line 96 by lead line 98.

The armature of solenoid 88 is connected to the lever arm 99 which engages the teeth of the spring loaded ratchet 100, for clockwise rotation of the ratchet whenever solenoid 88 is energized. The armature of solenoid 82 constitutes a pawl 101 which when the solenoid is de-energized is held against the ratchet 100 by a spring. When the reset switch 85 is closed, solenoid 82 is energized pulling the pawl downward thus allowing ratchet 100 to return to its starting or rest position with the conductor or pointer 102, attached thereto, resting against the stop 103. It is to be noted that all of lines, etc., with the exception of conductor 102, thus far described conduct 115 A. C. volts. For the remainder of the system, the transformer and rectifier tube in the photo-electric panel 69 converts the A. C. volts to D. C. volts of varying amounts depending upon the particular apparatus to which it is conducted.

In the panel 69, there is employed a conventional rectifier tube R and a capacitor K to insure a steady, non-fluctuating D. C. flow. The tube R is connected as a bi-phase, half-wave rectifier. A center tap 104 is connected to the line or conductor 105 which in turn is connected at one end to the conductor 102 of the stepping relay 81 and at the other end to line 106. A line 107 is connected between line 105 and the ground terminal 108. Line 106 connects the two terminals 109 and 110.

The photo-electric cell or scanning head 12 is of the usual design, there being a conventional amplifier tube (not shown) therein, such as a 6J7 tube, etc. The cable 111 on the scanning head carries six lead lines or conductors which are connected to the terminals 112, 113, 108, 114, 115 and 116 on the photo-electric panel 69. Terminals 112 and 113 are connected to the filament in the amplifier tube, terminal 108 to the ground line, 114 to the amplifier tube cathode control, 115 to the screen grid in the amplifier tube, and terminal 116 is connected to the plate circuit line which carries the impulse picked up by the photocell. Connected between line 106 and terminal 116 is a coupling capacitor X.

Terminals 109 and 110 are connected by lines 117 and 118 respectively to a grid switch 119. Line 120 connects line 106 with the grid of the thyratron tube Y. The plate of the thyratron tube is connected to terminal 121 by line 122. Terminal 121 is connected to the plate switch 123 by line 124, the switch in turn being connected to the magnet coil 57 by line 125. The magnet coil 57 is connected to the coil 126 in relay 90 by line 127, the other end of coil 126 being connected to terminal 128 by line 129. Lines 130 and 131, connected to lines 125 and 129 respectively, are connected to a lamp 132 which serves as a register indicator, i. e. it glows every time an impulse is sent through the panel 69 from the photocell. Line 133 is connected between line 129 and terminal 134 in relay 77. Terminal 135 in relay 77 and terminal 136 in the correction switch 137 are connected by the line or conductor 138. Terminal 139 in switch 137 is connected to the magnetic coil 140 in the magnetic clutch 44 by line 141. The coil 140 is connected to the dipole or direction reversing switch 142 by line 143.

In the stepping relay 81, the conductor arm 102 makes sliding contact with a number of terminals as the ratchet 100 is turned. These terminals are numbered from 0' to 6' and are connected by appropriate lead lines to corresponding switches 0'' to 6''. One exception is that there is no switch connected to terminal 1' which is connected directly to the line 144 which in turn is connected to the normally open side 145 of the dipole or micro switch 142. Switches 0'', 2'' and 3'' are likewise connected to lead line 144 and switches 4'', 5'' and 6'' are connected to the lead line 146 which in turn is connected to the normally closed portion 147 of dipole switch 142. The switches 0'' to 6'' of the stepping relay are located on the outside of the control box 74 as shown in Figure 1.

The reference switch 94, correction switch 137, and reset switch 85 are all actuated periodically in the order named by reason of the action of cams 148, 149 and 150 respectively. The cams are driven at the same rate from a drive shaft 151 which may be connected through suitable reduction gearing to the main machine driving system. In the system herein described, the

speed of shaft 151 is $\frac{1}{12}$ the cutter speed, i. e. each cam makes one revolution for each twelve cuts of cutter F. The speed of shaft 151 may be varied as desired with the corresponding increase or decrease of the number of terminals and switches in the stepping relay 81 or with the same number of terminals and switches which will appear more clearly after reading the description of operation thereof hereinafter.

The thyratron grid switch 119 and the plate switch 123 are mounted adjacent the end of the crank-shaft 33 in a housing 152 (see Figures 1 and 4). The crank-shaft 33 has two cams 153 and 154 mounted thereon against which spring contact arms 155 and 156 bear respectively. The actual engagement between the arms 155 and 156 and the cams 153 and 154 may be made by followers 157. The switch 119 is in series with the grid circuit of the thyratron tube Y so that when switch 119 is open, the photocell cannot affect the tube. The switch 123 is in series with the plate of tube Y, the magnetic coil 57, coil 126 in relay 90 and the source of current T, which is preferably 300 D. C. volts.

At the start of operation, the rod 20 is adjusted in slot 24 to give the proper stroke which is preferably at a position to give a slight overfeed of up to .005 to .01 inch. The scanning head or photocell, which may be set to register on a light increase or a light decrease, is adjustable both longitudinally and transversely of the band thereunder. The photocell is adjusted to register when a particular point or index mark on the web or band passes thereunder and this near the end of the forward feeding stroke so that it may receive an impulse from the change in light-reflecting characteristics of the web caused by the passage of the index mark or pattern element into the field of view of the photocell, which passage indicates the need for correction.

The system is so set up that a correction in the feeding stroke is not made each time a band is cut but a suitable number of cuts is chosen as a cycle and the correction made is an average. As the device is shown in the drawing (see particularly Figure 2, twelve cuts is chosen as a cycle. During the first six cuts, the system totalizes the impulses received from the thyratron thereby closing either an "increase" circuit or a "decrease" circuit. In accordance with whichever of these circuits is closed during the second six cuts, or any number of cuts less than six, the adjustment in the feeding stroke is made and then the mechanism is reset for the next cycle. It is to be understood that any number of cuts may be chosen to constitute one cycle, depending upon the tolerance in size permissible in the finished product. The change in cycle is accomplished by increasing or reducing the speed of cam-shaft 151 and also increasing or decreasing the number of terminals or contact points and switches in the stepping relay 81.

Assuming that the photocell is picking up an impulse, cam 148 closes the reference switch 94 for a period of six cuts or strokes. During this period, the correction switch 137 and the reset switch 85 are open so that whenever the coil 126 in relay 90 is energized, due to an impulse from the photocell, the solenoid 88 will be energized thus rotating the arm or conductor 102 in the stepping relay 81 to the next succeeding terminal. In order for the impulse from the photocell to close the switch in relay 90, the thyratron grid switch 119 must be closed when the cell receives the impulse or there is a decrease or increase in light received thereby. The switch 119 is opened and closed by the action of cam 154 on the crank-shaft 33 which makes one revolution for each cut. The cam is adjusted to close the switch 119 just prior to the completion of the forward stroke. The plate switch 123, controlled by cam 153 mounted on shaft 33, is also closed when switch 119 is closed and remains closed during the complete forward stroke and is opened during the return stroke.

As a photocell is energized by a mark on the band, the impulse received when switch 119 is closed fires the thyratron tube Y which completes the circuit through switch 123, magnet coil 57, relay coil 126 and back to the power source T through terminal 128. Solenoid 88 moves the arm 102 to the next terminal and the energization of the magnet poles 55 of the magnet magnetically seizes the armature 54 which is drawn back into the space between the poles, thus swinging the gripping members 49 on their pivots 50 and pushing the gripping members forward so as to lift them off the web 3 therebelow. When this release of grip occurs, the tension drag at B restrains the web 3 and causes the lower reciprocating feeding member 15 to slip under the web without forwarding it. In this manner, the photocell terminates the forward motion of the web precisely at the time when the index or other printed matter influences the photocell. The action of the magnet takes place every time an impulse is received when switches 119 and 123 are closed irrespective of whether or not switches 137, 85 and 94 are open or closed. That is to say, the magnet coil 57 works independently of the stepping relay 81 and the correction mechanism or stroke adjusting means connected thereto.

As previously pointed out, switch 94 is closed during the first six cuts or strokes of the feeding mechanism. Then switch 94 is opened and switch 137 closed by the action of cam 149. While correction switch 137 is closed, the necessary correction or adjustment in the length of the feeding stroke is made. As previously pointed out, cam 149 may be any size to keep the correction switch closed for one or more strokes up to six. As shown, cam 149 will keep switch 137 closed for approximately three strokes. When switch 137 is closed, a circuit is completed from the power source T, through line 105, stepping relay 81, either line 144 or 146 depending upon which terminal arm 102 is on contact with, through the dipole switch 142, line 143, coil 140 of magnetic clutch 44, line 141, switch 137, relay 77, line 133, and through line 129 to the power source by means of terminal 128. For purposes of illustration, suppose during the correction register period while switch 94 was closed, arm 102 was advanced to terminal 5' in the stepping relay 81. Terminal 5' is connected to switch 5'' which is in turn connected by line 146 to the upper switch 147 in 142 which is normally closed. When the friction-clutch arm 158 attached to the friction clutch 159 mounted on the rocker shaft 26 is swung in a counterclockwise direction, as viewed in Figure 2, then switch 147 is closed completing the circuit and energizing the magnetic clutch 44. Thus the circuit is complete on the return stroke of the feeding plate 15. The stop 160, however, stops the arm 158 from rotating immediately upon disengaging the dipole switch. Therefore, for the remainder of the backward stroke, the magnetic clutch 44 being energized engages shaft 43, and due to the linkage connection 161, 162 and 163 between the mag-

netic clutch 44 and the rocker shaft 26 (see Figure 3) causes the stroke adjuster shaft to rotate in a counterclockwise direction which causes the follower 36 (Figure 1) to move along the screw shaft 37 in the direction marked "decrease" thus decreasing the length of the feeding stroke. When the arm 158 swings in a clockwise direction, it closes switch 145 and opens switch 147 thus breaking the circuit and preventing any clockwise rotation of shaft 43. To insure against any rotation of shaft 43 when the magnetic clutch 44 is deenergized, a damper 164 is placed on shaft 43. Conversely, when the arm 102 is resting on terminal 3' in the stepping relay, the rotation of shaft 43 occurs in a clockwise direction when arm 158 is pressed against the dipole switch and the circuit is completed through switch 3'', line 144, switch 145, etc. This results in follower 36 moving along screw-shaft 37 in the direction marked "increase" and the length of the feeding stroke is increased. Thus the adjusting of the length of the feed stroke by turning the hand-knob 45 is eliminated and need only be employed when a radical and quick adjustment is needed.

This correction takes place during the first three strokes of the second half of the 12-stroke cycle whereupon cam 150 engages the reset switch 85 which energizes the solenoid or coil 82 which removes the pawl 101 from engagement with ratchet 100 and the latter returns to its starting position with arm 102 resting against stop 103. It is to be noted that stepping relay switches 0'' and 4'' are open as shown. The stepping relay 81 is in effect a correction rate switch. The correction is based on an average number of cuts or strokes rather than on each individual stroke. When the feeding mechanism is originally adjusted, it is done in such a manner as to overfeed, as hereinbefore described. The correcting magnet 57 corrects the overfeed on each individual band cut by impulses received from the photocell. The stroke adjusting mechanism connected to the stepping relay maintains the system as closely as possible to the original setting and readjusts the feeding means after each cycle or so many strokes, in the case at hand there being a cycle of 12 strokes. Switch 0'' is open so that no correction or adjustment in the length of the feeding stroke will be made when no impulse is received while the reference switch 94 is closed. Switch 4'' is opened thus indicating that the ideal operating condition is that when four impulses are received during the first six strokes of the cycle or while reference switch 94 is closed. Thus, when switch 137 is closed, the stroke adjuster shaft 43 will not be rotated since the circuit to the magnetic clutch is broken by reason of switch 4'' being open. When more than four impulses are received and arm 102 rests on terminal 5' or 6', it indicates that the stroke must be decreased in length and such will be the case as previously described. When less than four impulses are received, and arm 102 rests on terminal 1', 2', or 3', it indicates that the length of the stroke must be increased.

Any combination of switches 0'' to 6'' may be open or closed as desired. This would be governed by the permissible tolerance in the size of the cut bands. For example, suppose switches 0'', 3'', 4'', and 5'' were open and switches 1'', 2'' and 6'' closed. Then no adjustment would be made in the length of the feeding stroke so long as either three, four, or five impulses were received from the photocell during the first half of the cycle or while switch 94 was closed. It can readily be seen that the size of the cut bands would vary more than in the case as shown with only switches 0'' and 4'' open. The apparatus of the present invention is capable of operation within a tolerance in cut band size of one millimeter or more.

The apparatus of the present invention speeds up production and cuts down cost thereof since only one operator is needed per machine and the operator is free to remove the cut bands from the stacker and inspect them periodically and then pack them. The operator does not have to worry about the feeding stroke correction or adjustment which is all automatic. The present invention may be employed for cutting any indexed or printed web. For example, it may be employed to cut substantially uniform lengths repeatedly from a ribbon of regenerated cellulose, paper, felt, a fabric, or from a flattened tube of such material, such as regenerated cellulose sausage casings, or tubes used for forming bottle bands and the like. The webs or flattened tubes may be made of any desired material, such as cellulose derivatives, of which cellulose acetate and cellulose ethers such as ethyl cellulose and hydroxyethyl cellulose are representative, resinous bands such as those of vinyl resins, nylon, polyethylene, proteins, such as casein, and the like. The web may contain any indicia, labels, printed designs or the like desired and any portion of each of such marks that is preceded by or followed by a relatively contrasting portion of the web may be employed. While the light-responsive system actually shown depends upon light reflected from the web, it may be employed when the web has some transparent or even translucent portions in cooperation with the light source positioned to transmit light through the web. Numerous other advantages of the present invention will be apparent to those skilled in the art.

It is to be understood that changes and variations may be made in the description and drawing without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In apparatus including mechanism for cutting individual wrappers from a continuous band of wrapping material having portions with different light qualities, gripper means for intermittently advancing said band to the cutting mechanism, a photoelectric cell directed towards said band and positioned to be influenced by changes in said light qualities, and means for generally controlling the amount of band material advanced by the gripping means on each stroke, said controlling means being responsive to impulses received from the photoelectric cell, the improvement which comprises in combination, means for adjusting the stroke of the gripper, means for totalizing the number of impulses from the photoelectric cell, cyclical means driven in timed relation to the stroke of the gripper means for rendering the totalizing means inoperative to receive impulses from the photoelectric cell during a predetermined number of strokes and operative to receive impulses from the photoelectric cell during a predetermined number of strokes and means controlled by the totalizing means for operating the stroke adjusting means during the inoperative part of the cycle of said cyclical means.

2. Apparatus as defined in claim 1 in which the cyclical means is a cam-actuated switch.

3. Apparatus as defined in claim 1 in which the totalizing means is a stepping relay.

4. Apparatus as defined in claim 1 in which the cyclical means is a cam actuated switch and the totalizing means is a stepping relay.

5. Apparatus as defined in claim 1 in which the totalizing means is a stepping relay having a first series of steps connected electrically to a single conductor which when a circuit is closed therethrough, activates the stroke adjusting means to increase the stroke of the gripper, and a second series of steps connected electrically to a second conductor which when a circuit is closed therethrough activates the stroke adjusting means to decrease the stroke of the gripper, whereby the stroke adjusting means is selectively operated in opposite directions to increase or decrease the stroke of the gripper in accordance with the position of the stepping relay at the end of the operative part of the cycle.

6. Apparatus as defined in claim 1 in which the totalizing means is a stepping relay having a first series of steps connected electrically to a single conductor which when a circuit is closed therethrough, activates the stroke adjusting means to increase the stroke of the gripper, a second series of steps connected electrically to a second conductor which when a circuit is closed therethrough activates the stroke adjusting means to decrease the stroke of the gripper, and an intermediate step between said first and second series of steps said intermediate step being disconnected from the stroke adjusting means whereby the stroke adjusting means selectively increases, decreases or unaffects the stroke of the gripper in accordance with the position of the stepping relay at the end of the operative part of the cycle.

7. Apparatus as defined in claim 6 having means for resetting the stepping relay during the inoperative part of the cycle.

8. Apparatus as defined in claim 6 having means for selectively closing a circuit to the stroke adjusting means during the inoperative part of the cycle and opening said circuit during the operative part of the cycle.

9. Apparatus as defined in claim 6 having means for resetting the stepping relay during the inoperative part of the cycle, and means for selectively closing a circuit to the stroke adjusting means during the inoperative part of the cycle and opening said circuit during the operative part of the cycle.

10. Apparatus as defined in claim 6 having a cam-actuated switch for the cyclical means, means for resetting the stepping relay during the inoperative part of the cycle, means for selectively closing a circuit to the stroke adjusting means during the inoperative part of the cycle and opening said circuit during the operative part of the cycle, a circuit between the photoelectric cell, the cam-actuated switch, and the stepping relay, a thyratron tube in said circuit, a switch in said circuit for firing the tube, and means for closing said switch at a predetermined point in the stroke of the gripper means for momentarily conditioning the circuit to receive an impulse from the photoelectric cell.

11. In apparatus including mechanism for cutting individual wrappers from a continuous band of material having portions with different light qualities thereon, a reciprocating member across which the band is carried, gripper means associated with said reciprocating member and cooperating therewith to intermittently advance the band to the cutting mechanism, a photoelectric cell directed toward said band and positioned to be influenced by changes in said light qualities, and means for generally controlling the amount of band material advanced by the reciprocating element on each stroke, said controlling means being responsive to impulses received from the photoelectric cell, the improvement that comprises in combination, a stepping relay, means including a thyratron tube for energizing said relay, a cam-actuated switch driven in timed relation to the reciprocating member for firing the tube at a predetermined point in the stroke of the reciprocating member, a first circuit between the photoelectric cell, the switch, the tube, and the relay, a second switch in said circuit, a cam for opening and closing said second switch to maintain the circuit open during a predetermined number of strokes of the reciprocating member and to close the circuit during a predetermined number of strokes of the reciprocating member thus completing a predetermined cycle, means for adjusting the stroke of the reciprocating member including a variable toggle linkage, a screw-threaded shaft for adjusting said variable linkage, a magnetic clutch connected to said screw shaft, a second circuit between the relay and said magnetic clutch, and a cam-actuated switch in said circuit for closing the circuit when said first circuit is open to selectively energize the magnetic clutch whereby the screw shaft is turned in accordance with the position of the stepping relay as determined during the part of the cycle in which the said first circuit is closed.

12. Apparatus as defined in claim 11 in which the means for generally controlling the amount of band material advanced by the reciprocating element on each stroke comprises a magnetically controlled release for the gripper means, and electrical connections between said release and the tube circuit whereby the grippers are released whenever the tube is fired.

13. Apparatus as defined in claim 11 in which the means for generally controlling the amount of band material advanced by the reciprocating element on each stroke comprises a magnetically controlled release for the gripper means, electrical connections between said release and the tube circuit whereby the gripper is released whenever the tube is fired, and means for resetting the release.

14. Apparatus as defined in claim 11 in which the reciprocating member is actuated from an oscillating shaft, a lever arm connected to said shaft, a lever arm connected to the magnetic clutch, a link connecting said lever arms whereby motion of the oscillating shaft is transmitted to the screw shaft only when the magnetic clutch is energized.

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