

Jan. 17, 1961

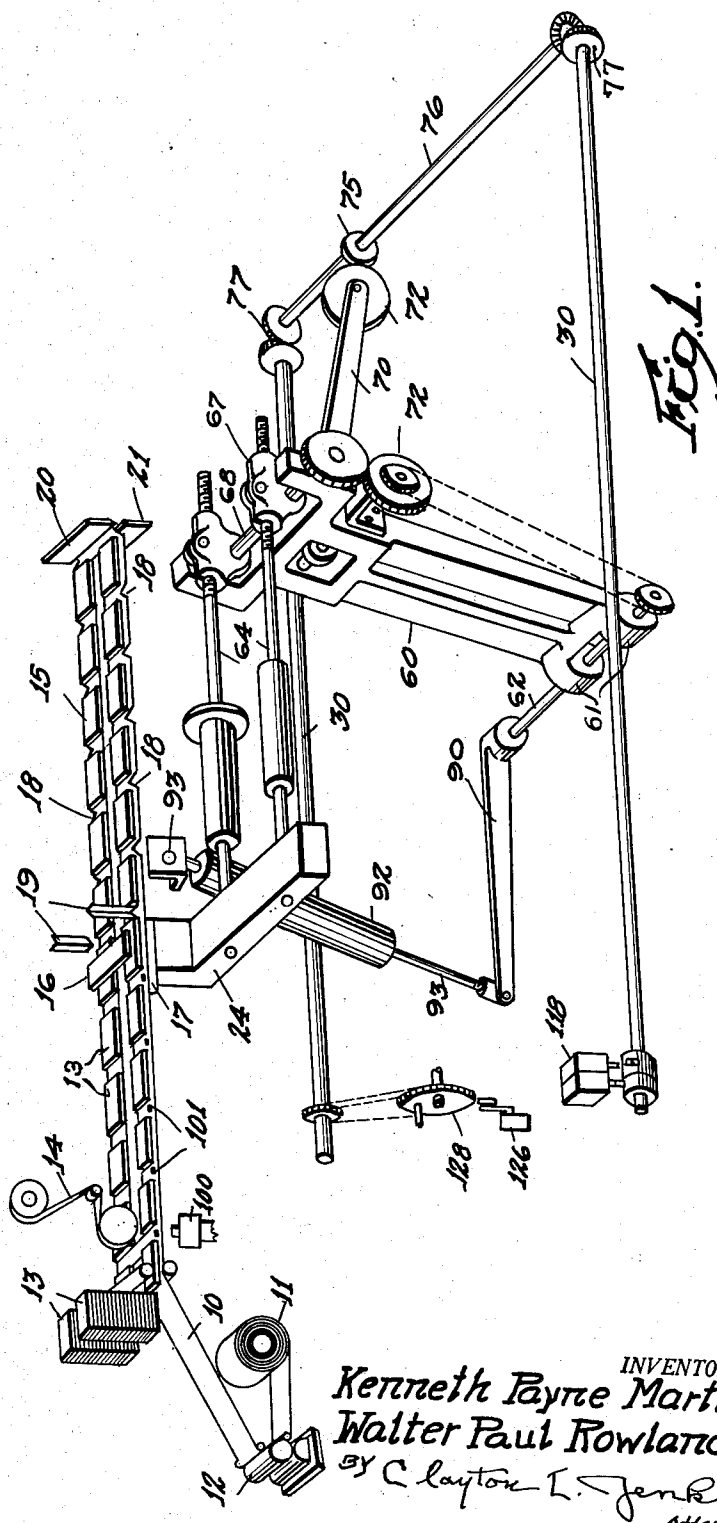
K. P. MARTIN ET AL

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ELECTRONICALLY CONTROLLED BOOK CASE STRIP FEED MECHANISM

Filed Dec. 13, 1956

4 Sheets-Sheet 1



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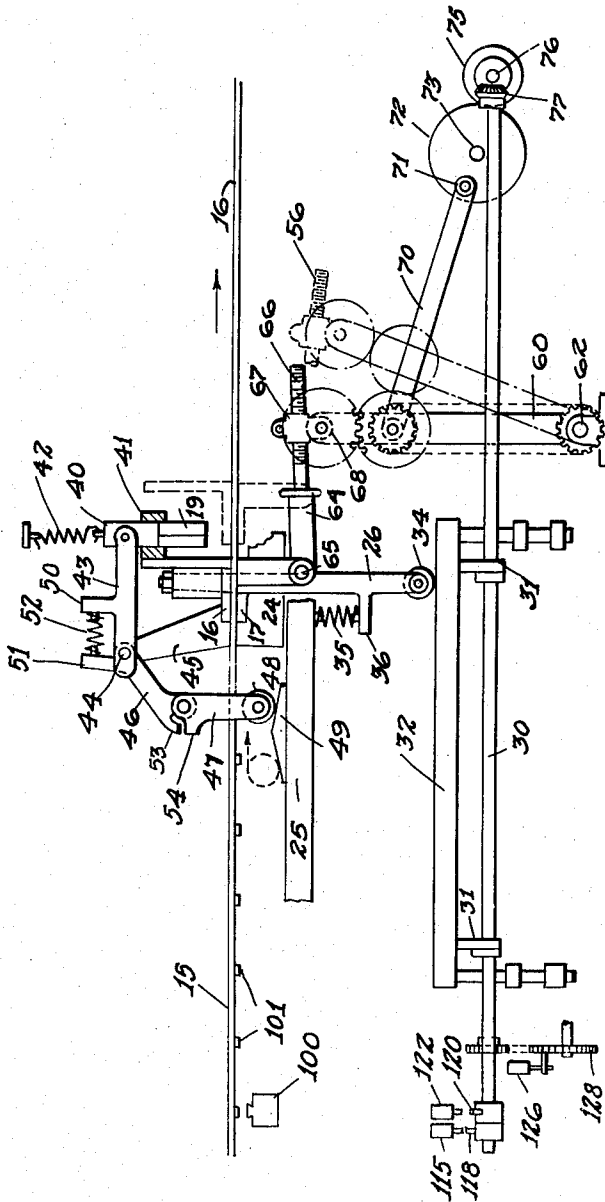


Fig. 2.

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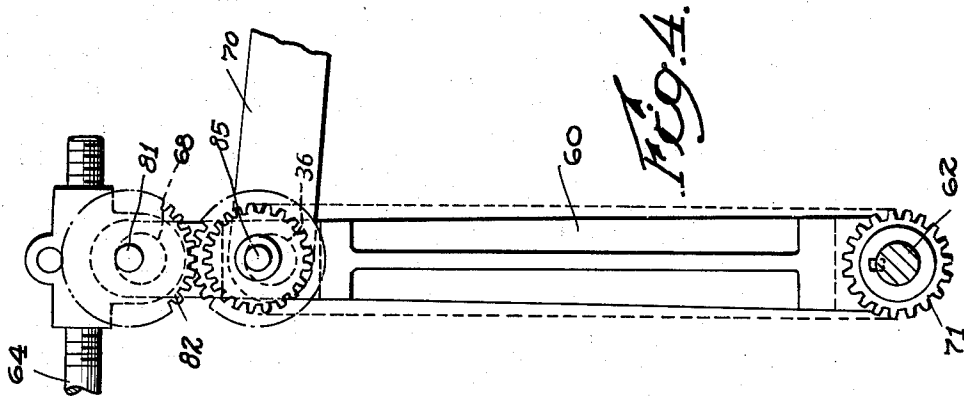
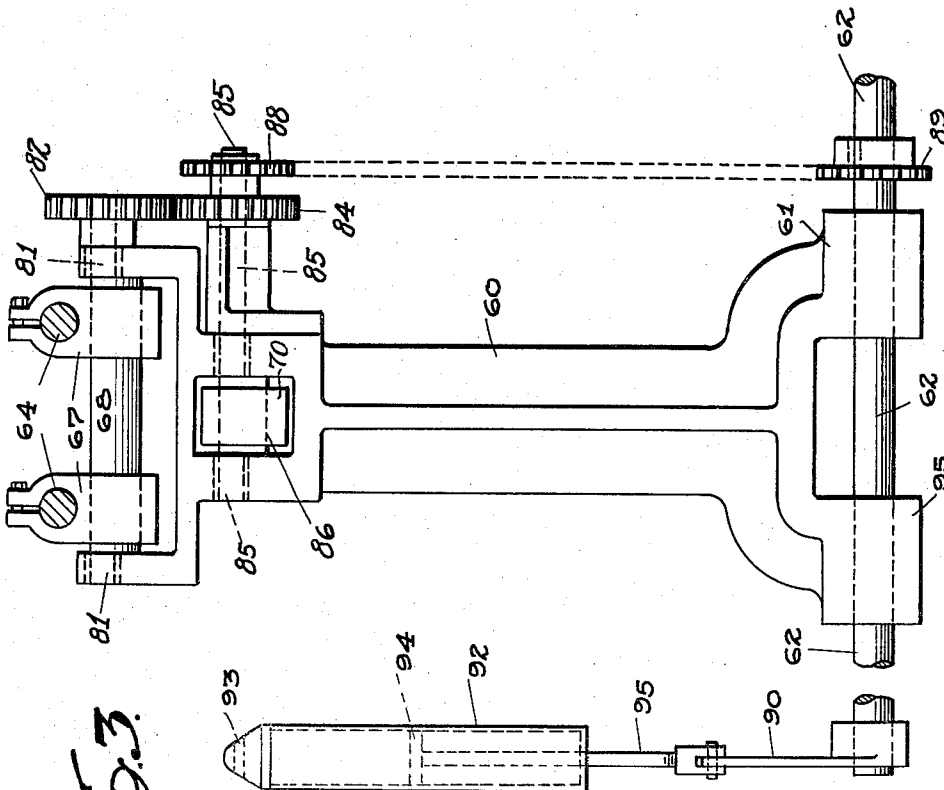
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4 Sheets-Sheet 3



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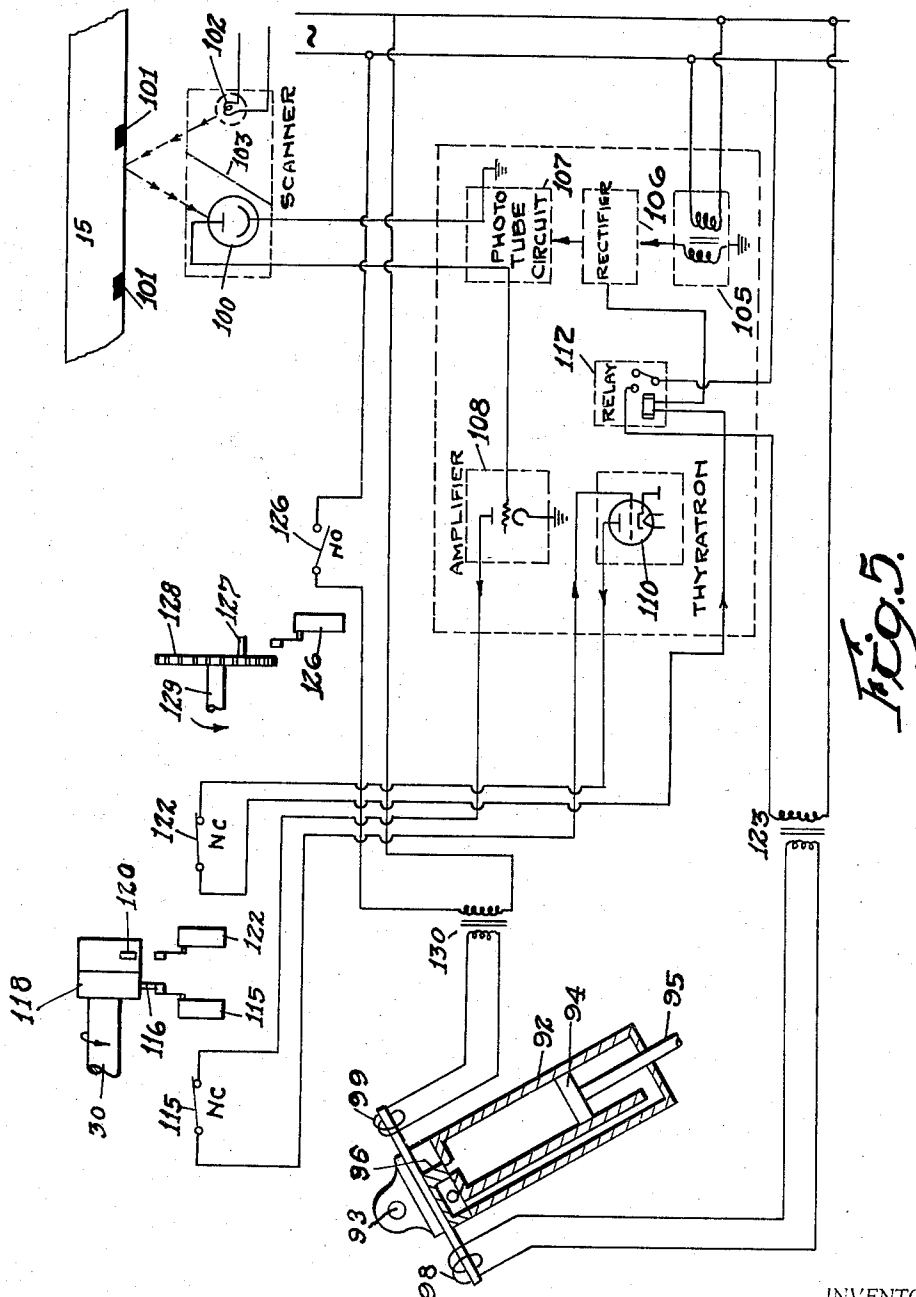
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ELECTRONICALLY CONTROLLED BOOK CASE STRIP FEED MECHANISM

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ELECTRONICALLY CONTROLLED BOOK CASE STRIP FEED MECHANISM

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3 Claims. (Cl. 226—32)

This invention relates to a book case manufacturing machine, and more particularly to mechanism which insures registering of the case strip as it is moved by a feeding mechanism with a knife which cuts the strip.

A book case may be made continuously by feeding a web of outside strip material, such as paper, over a glue-applying roller and thence to a position where separate cardboard covers are mechanically applied in a spaced relationship by a reciprocable pusher onto the top of a single strip or two strips coated with glue, after which the case strip thus formed is fed beneath a set of knives, one of which serves to notch each side of the case strip between the covers, and another cuts the strip in two to form the separate book cases. A back lining tape may also be applied to the central portion of the case strip after assembly of the covers so as to strengthen the back of the book. This tape is customarily fed from a supply roll in such a position that it is automatically laid in place on the glued material. After the covers and tape have been assembled, the case strip is notched on its opposite sides to form flaps, and these are progressively folded over and rollers press them down onto the cardboards. After the book signatures and end sheets have been glued in place within the case, the in-folded flaps of the paper strip are concealed.

If the paper strip has been pre-printed with a design, and often including wording, it is necessary that the design be registered relative to the corners of the cardboard covers. However, under various climatic changes the paper may stretch more at one time than at another, or through variations in the power drive, the strip may not be moved at an exact rate required for notching or cutting the paper at the required locations. Hence, registry of the continuous moving case strip with the knives is difficult.

The primary object of our invention is to overcome these various problems and to provide an automatic mechanism which will insure registry of the continuous case strip with the cutting knives and other associated mechanism.

In accordance with our invention, we propose to feed the continuous strip of paper, or other suitable material, on which the covers are mounted at a rate which is slightly greater, or slightly less, than the rate required for synchronization with the cutting knives, and to scan by means of an electric eye a set of marks applied in spaced relationship on the strip and thereby automatically control mechanism which periodically retards (or increases) the rate of forward feed of the book case strip to synchronize it with the knife movement and effect the needed registry. The case strip is preferably fed forward intermittently by means of clamping jaws which

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periodically grip the strip and move it a definite distance through a fixed cycle. We propose to control the length of forward movement applied by a pusher of the reciprocating mechanism and to decrease (or increase) it periodically as needed for registry. For example, the feed mechanism may be reciprocated through a slightly longer stroke than is required for a correct measurement of book case movement so that the case strip is moved slightly farther than needed. Then, by means of an electric eye scanning mechanism and its associated controlled parts, the stroke of the reciprocating mechanism is slightly lessened periodically and repeatedly, if necessary, to return the case strip to its proper registry with the cutting mechanism. The electric eye may scan a series of marks printed on the edge of the paper strip, which may be later cut out by means of the notching knife, and if that mark is in registry with the eye at a given time of electrical energization thereof, then nothing happens to the feed mechanism; but if the strip mark is out of synchronization with the eye activation, an electric circuit is rendered effective to change the stroke of the reciprocating mechanism. This is preferably effected by means of an eccentric so related to the pusher as to change the length of stroke thereof.

In the embodiment illustrated, a piston mechanism is energized periodically by an electric eye control apparatus to rotate an eccentric through a small angle, and that eccentric is connected to the clamp reciprocating mechanism by a crank arm mounted on the eccentric which serves when the eccentric is rotated to vary the length of stroke of the crank arm and thereby vary the distance through which the case strip is fed forward by a single reciprocating stroke. The eccentric is returned to an initial or zero position at the end of each adjustment so that it is always ready for changing the stroke for as many times as is needed to bring the strip back into registry with the knives and other parts of the machine.

Referring to the drawings which illustrate diagrammatically one embodiment of the invention:

Fig. 1 is a diagrammatic and fragmentary perspective view of the reciprocable case feeding mechanism in association with a continuous pre-printed web or strip carrying spaced covers thereon;

Fig. 2 is a diagrammatic and fragmentary side elevation of related portions of the web moving and cutting mechanism;

Fig. 3 is an enlarged end elevation of the work clamp oscillating mechanism, and showing the piston-actuated eccentrics arranged to govern the work feeding stroke;

Fig. 4 is a side elevation of the parts shown in Fig. 3; and

Fig. 5 is a wiring diagram shown in its relation to the mechanical parts which control the operation of the web feeding mechanism.

In accordance with this procedure, as indicated diagrammatically in Fig. 1, a web 10 of paper or cloth, which has been pre-printed, is fed from a roll 11 as a single piece, or slit into two strips, and passed over a glue-applying roll 12 to a position where suitable reciprocating pusher mechanism periodically removes the lower cardboards 13 of two stacks and deposits these boards in pairs on the web in a required spaced relationship. Also, a strip 14 of a back-lining tape or heavy paper material may be drawn from a suitable supply and glued in place between the spaced cardboards 13 while they are travel-

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ing forward in a horizontal arrangement. The web 10 with its applied cardboards and back-lining tape 14 forms a case strip 15 which is moved forward intermittently over a suitable frame or table by means of a reciprocable carriage and clamp. The latter comprises a movable top clamping plate 16 and an under plate 17 (Fig. 2) arranged to grip the adjacent pair of covers and supporting case strip periodically and move the same only in one direction and then be disengaged from the case strip during a reverse or backward movement. This periodically reciprocated clamp draws the web 10 intermittently from its source of supply and feeds it forward to knives which cut notches 18 in its edges. These notches are cut by vertically reciprocable knives 19 carried by the longitudinally reciprocating carriage, in preparation for the outwardly extending side portions of the web being folded back over the cardboards 13. A further cutting mechanism, shown diagrammatically in Fig. 1, comprises a vertically reciprocable knife 20 and a stationary knife plate 21 of standard construction and operation which serve to slice the case strip between the cardboard covers and to form separate book case units. These are operated in timed relationship with the case strip movement so as to cut the strip when the latter is stationary.

This invention pertains primarily to the clamp reciprocating mechanism and a control of the length of stroke of the clamp in its forward movement of the web. Both plates of the clamp are suitably supported on a horizontally reciprocable carriage frame 24 slidably mounted on two parallel slide rails 25, as shown in Fig. 2, extending longitudinally of the machine. The lower clamp 17 is formed by a transverse plate extending between the two slides 24 on the slide rails. The movable clamp 16 is a transverse plate above the plate 17 and arranged to grip a pair of covers 13 simultaneously. The upper clamp plate 16 is moved vertically by a rod 26 suitably secured thereto which is lifted periodically by a cam mechanism illustrated diagrammatically in Fig. 2. The lower plate 17 on which the case strip rests is a part of the carriage and it is necessary to lift the upper plate 16 while the carriage moves. The cam mechanism which provides for this reciprocatory movement comprises a positively driven horizontal power shaft 30 carrying cams 31 thereon which, as they revolve, lift periodically a heavy bar 32. The upper surface of the bar constitutes a horizontal runway for the roller 34 carried on the bottom of the vertically reciprocable rod 26 which is slidably supported on the carriage 24. A spring 35 under tension is held between a lateral lug 36 on the rod 26 and the rail 25 or a suitable part on the machine frame. The spring serves to force the clamp 16 down against the web and opposed to the lower clamp 17 when the cam actuated bar 32 is in its lowermost position. The clamping members 16 and 17 are adapted to be free from the case strip during the return movement toward the left in Fig. 2, and then to be clamped against the case strip when about to move towards the right, as caused by the carriage reciprocating mechanism. Since the top of the cam bar 32 is horizontal, the movable clamping jaw may be operated at any position of the horizontally reciprocable carriage 24 which carries the clamps. Thus the case strip is moved intermittently towards the right.

The knives 20 and 21 are mounted in fixed positions on the machine frame and are reciprocated by mechanism which is timed to operate in a definite relationship relative to the uniform operation of the power driving mechanism. The parallel notching knives 19 are mounted on the carriage and are also operated in timed relation therewith. These knives are suitably mounted on slides 40 (Fig. 2) reciprocable vertically in two sleeves 41 in parallel arrangement which are supported by the carriage 24. These knives 19 have triangularly shaped cutting edges positioned and arranged to cut the notches

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18 in the sides of the web and thus form opposed flaps which are to be folded back over the top of the cardboard. Each slide 40 is urged upwardly by a suitable spring 42 connected between the slide and a fixed portion of the machine. The slide is moved downwardly by a cam operated rocking link 43 which is pivoted on a pin 44 on an arm 45 fixed on the carriage 24. An obliquely positioned lever of the first class 46 is also pivoted on the pin 44, and this link is in turn pivotally connected to a vertically reciprocable member 47 carrying a roller 48 on its lower end. That roller is adapted to ride up over a low stationary V-shaped cam 49 mounted on the slide rail 25 or the machine frame. In order that the knife may be reciprocated only by the forward movement of the carriage towards the right, the rocking link 43 has an upstanding centrally located lug 50, and the link 46 has a lug 51 at its upper end parallel to lug 50. A compression spring 52 between the two lugs serves to apply a required downward motion to the link 43 and the knife 19 when roller 48 lifts the link 46. The link 46 is arranged at an angle to the horizontal, and it has a lateral lug 53 engageable by a further lug 54 on the lower vertical member 47. These lugs are urged into contact by the spring 52, so that when the cam roller 48, moving towards the right in the direction of the arrow, rides over the cam 49, the two lugs 53 and 54 serve to rock the right hand end 43 of the flexible lever assembly downwardly and thus cause the triangular knife 19 to cut out the notch 18 on the edge of the web. This action is cushioned by the spring 52. When the roller 48 goes in the opposite direction up the triangular cam 49, the resistance of the cam causes the lugs 53 and 54 of the joint to separate and the knife 19 is not actuated. Hence the notch 18 is cut only on the forward motion of the clamp carriage and in timed relation therewith. The card boards are pushed onto the web 10 by a device connected by a rod to the carriage 24 (not shown) so that the operations of feeding the card boards to the web and of clamping the boards in parallel to move the case strip are in timed relationship with the carriage movement.

In our construction, the clamp carriage 24 is reciprocated by means of a rocking standard 60 having an adjustable stroke connection therewith. The standard has its lower bifurcated end provided with bearings 61 which are pivoted on the rock shaft 62, as shown in Figs. 2 and 3, carried on the machine base. The upper end of the standard is pivotally connected with a portion of the carriage 24 by means of a pair of connecting rods 64 of adjustable length which are pivoted at 65 (Fig. 2) on a horizontal bearing carried by the carriage. Each connecting rod 64 is threaded at its right hand end 66 and adjustably mounted in a threaded sleeve 67 which is pivoted on a cylindrical cross shaft 68 on the rocking standard 60. The thread adjustment provides for shortening or lengthening the connecting rod 64 so as to adjust the position of the carriage and its clamps relative to the book case strip that is to be fed forward. The rocking standard 60 is rocked by means of a pitman rod 70 (Fig. 2) connected to a crankpin 71 on a crank wheel 72 fixed on a horizontal shaft 73 driven by the main power drive of the machine. Thus, as the pitman rod 70 is reciprocated, the rocking standard 60 causes the connecting rods 64 to move the clamp carriage 24 back and forth.

The reciprocation of the carriage 24 is timed with the operation of the clamps by having the camshaft 30 driven with the crankpin drive of the pitman 70. This is effected by a gear 75 (Fig. 1) mounted on a cross shaft 76 driven by the main drive and which is suitably connected through beveled gears 77 with the two longitudinal shafts 30 on the opposite sides of the machine which cause the lifting of the cam bar 32. Thus, by a proper orientation of the cams 31, the clamps may be brought into contact with a pair of opposed covers of

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the case strip when the carriage is at its left hand position and the cams 31 permit the cam bar 32 to be in its lowermost position and the spring 35 to pull the clamps 16 and 17 into tight engagement with the case strip. When the pitman 70 moves towards the right, it draws the carriage 24 forward and so moves the case strip and pulls the web 10 from the roll 11 as well as aids in other associated features of the machine.

In accordance with our invention, the machine mechanism is so adjusted that the case strip is automatically drawn forward toward the right through a slightly greater distance than required. An electric eye controlled mechanism is provided to compensate for this overfeeding of the web and periodically shorten the forward motion of the connecting rod 64. If desired, the mechanism may be adjusted and operated to compensate for under feeding the web, and this lies within the scope of the invention. This compensation for over or under feeding of the case strip is accomplished by means of eccentrics which are so located and adjusted that for a maximum throw position thereof the connecting rod assembly between the crankpin 71 and the carriage pin 65 provides a definite and maximum length of stroke. The eccentrics are so arranged that when turned through a given angle, they serve to shorten the total distance between the points 71 and 65, so that the reciprocation of the pitman rod 70 can move the carriage only through a shorter distance and thus feed the case strip 15 correspondingly. This adjustment of the eccentrics is provided for automatically.

As shown particularly in Figs. 3 and 4, the connecting rod is arranged as two parallel members 64 which are pivoted on a depending part of the clamp carriage 24 (Fig. 2) and are adjustably connected to the rocking standard 60. The threaded sleeves 67 which carry the rods 64 are pivotally mounted on the cylindrical bearing shaft 68. This shaft has its bearing ends 81 so arranged at the upper end of the rocking standard as to be eccentric relative to the center of the shaft 68. Thus, by rotating the shaft 68 about its bearings, the eccentricity is varied and thus varies the effective length of throw of the connecting rods 64 as they are moved one way or the other. The shaft end 81 has a spur gear 82 keyed thereto, and this gear wheel is driven by a spur gear 84 keyed on the end of a second shaft 85 suitably mounted in bearings in the standard below and parallel to the upper shaft 68. The lower shaft 85 has a medial cylindrical bearing surface 86 eccentric to the shaft axis. The pitman rod 70 has an enlarged upper end provided with an internal cylindrical bearing riding on the eccentric portion 86 of the shaft. Hence rotation of the shaft shifts the pitman endwise, due to the eccentricity. Since the two gears 82 and 84 are of the same size and geared together, their rotation about their relatively fixed axes serves to rotate the two eccentrics 68 and 86 equally, so as to shorten the connecting rod 64 and the pitman 70. Thus, these two eccentrics shorten the effective length of the connecting rod and the distance through which the clamp carriage may be moved for a single reciprocation.

The rotation of the eccentrics 68 and 86 is effected by means of a sprocket 88 keyed on the shaft 85 and driven through a suitable sprocket chain from a sprocket 89 mounted on the lower shaft 62 which rockingly supports the standard 60. Turning that shaft 62 through a small angle, such as 10° or 15°, thus serves to rotate the eccentrics through a corresponding angular distance because of the equal sizes of the sprockets 88 and 89. This rocking of the eccentric is caused, as is shown diagrammatically in Fig. 1, by means of a lever 90 keyed to the end of the shaft 62 which passes freely through the pivot bearings 61 (Fig. 3) of the rocking standard 60.

The rocking action is caused by a "Bellows" air cylinder 92 of standard construction, shown diagrammatically

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in Figs. 3 and 5, which is pivoted on a horizontal pin 93 on the machine frame. The cylinder has a reciprocable piston 94 connected pivotally through a piston rod 95 with the rocking lever 90. Air under pressure is suitably admitted into the cylinder chamber on opposite sides of the piston 94 (Fig. 5) from an air supply controlled by a solenoid actuated sliding valve 96 located in the head of the cylinder. The air cylinder is pivotally mounted at 93 so that it may rock and permit its piston rod 94 to cause a swinging motion of the rocking lever 90 and thus rotate the eccentrics. The slide valve 96 is moved by means of one or the other of two 8 volt 60 cycle solenoids 98 and 99 which are governed automatically by the system, and thus serve to introduce air under pressure into either piston chamber as required.

The machine is so adjusted that the case strip is moved through a slightly greater distance at each carriage reciprocation than sufficient to maintain the center of the space between two covers exactly positioned for cutting the notch 18 and particularly for severing the strip at a center point by means of knife 20. Hence the case strip creeps ahead slowly, so that after perhaps 15 or 20 carriage reciprocations the notch 18 is too far off a correct position and compensation is needed. This requires actuating the solenoid 98 and causing the slide valve to admit air to the underside of the piston and rock the arm 90 upwards and rotate the eccentrics to shorten the carriage feed stroke. This is preferably effected by electronically scanning a series of spaced marks on the case strip and when registry with an electric eye is out of phase with the movement of a reference member moved uniformly by the power mechanism, the eye causes actuation of the piston.

To provide the necessary compensation for the slight uniform overfeed of the case strip and periodically shorten or slow down that feed so as to return a register mark into the proper relationship or phase with the cutter knives and other machine parts, we have mounted an electric eye or photo tube 100 where it may scan a series of black rectangular marks 101 printed on the edge of the case strip 15, as shown diagrammatically in Figs. 1 and 5. The dark colored marks 101 are spaced equally along one edge of the web, and these may be so located that the cutting knife 19 will cut out each mark after the latter has finished its useful purpose. The preferred apparatus is a General Electric CR7515-W200 one-way cut-off register control, which is a standard construction on the market and need not be described herein. The photo tube circuit is preferably such that the thyratron tube 10 is energized or fired when the photo tube light reception is decreased by the dark mark 101. The scanning head comprises a source of light 102 separated by a baffle 103 (Fig. 5) from the photo tube 100, and the latter receives its light by reflection from the case strip, as indicated by the broken arrow lines in Fig. 5. The black spot 101 on a light background gives a maximum difference in light reception so that the tube 100 is made effective when the black spot comes into view, a decrease of light in the photo tube decreases the grid voltage and increases the anode voltage of the amplifier and causes the thyratron to conduct.

When the parts are in register, the electric eye is activated periodically by the spots 101 in timed relationship with the carriage reciprocating mechanism, and the circuits are such that the photo eye does not create a signal for making a correction in the case strip feed. If, however, the photo eye is fired out of synchronization with a reference member moving in timed relationship with the power drive and the web cutting knives, then a relay is operated to energize the air cylinder and turn the eccentrics to bring the web back into a position where the eye views the black mark at the correct time. The distance between the black marks on the web constitutes a machine cycle so that every register mark should be in front of the scanner eye 100 at the start

of the cycle. According to our system, we overfeed the web, although it may be positively underfed, and the error in register will always accumulate in only one direction. Hence, as the black mark 101 creeps ahead, if overfed, it ultimately gets to a position where correction is needed.

The diagrammatically simplified register control unit of Fig. 5 comprises an input transformer 105, a rectifier 106, a photo tube scanner circuit 107, an amplifier 108 and a thyatron tube 110 which govern a relay switch 112 arranged to energize solenoid 98 and cause actuation of the air cylinder to turn the eccentrics. To be synchronized with the passing of the register mark 101 over the scanning head is the actuation of a reference member comprising a normally closed selector limit switch 115 of the roller type (Fig. 5) which is operated by means of a pin 116 projecting from a rotary drum 118 on the drive shaft 30. The switch pin is synchronized with the power drive so that it revolves at the rate of one revolution per machine cycle as represented by the spacing between the scanner marks 101. That selector limit switch 115 connects the anode of the amplifier 108 with the grid of the thyatron tube 110 of the register control system. This switch being normally closed is opened only momentarily by actuation of the revolving pin 116 on the shaft 30 to break the thyatron grid circuit. On the same drum 118 is another pin 120 displaced approximately 15° behind the other pin 116. This pin 120 actuates automatically a normally closed reset limit switch 122 which serves to open the plate circuit of the thyatron tube. The D.C. relay 112 which controls the air cylinder is connected through switch 122 with the anode plate circuit of the thyatron tube and the parts are so arranged that the normally open relay is closed every time the photo tube causes the thyatron tube to conduct.

A contact of the closed relay 112 connects the power line with a transformer 123 which reduces the voltage from 110 to 8 volts, and this 8 volt circuit is connected to the solenoid 98. When the relay switch is closed, the slide valve 96 is drawn toward the left by solenoid 98 and thus causes the admission of air under pressure to the under side of the piston 94 and so forces it upwardly. This rocks the lever 90 in such a direction as to rotate the eccentrics relatively and shorten the stroke of the pitman rod system which moves the carriage 24. That is, this upward movement of the lever arm 90 serves through the sprocket drives to change the relative positions of the two eccentrics which work against each other so that the traverse stroke of the carriage which moves the case strip relative to the strip severing knife 20 is slightly shorter while the piston holds the lever 90 up.

The tolerance of the system is such that the black marks 101 on the case strip will not get out of register in three machine cycles. Hence, we arrange to reset the system after every third cycle. This is accomplished by actuating a normally open reset limit switch 126 by a pin 127 eccentrically mounted on a sprocket or wheel 128 which is revolved by its shaft 129 at a speed equal to 1/3 of the machine cycle, so that the pin makes its revolution once for each three movements of the other pins 116 and 120. The actuation of this limit switch 126 causes it to close the circuit of a main power line through another step-down transformer 130 to apply an 8 volt current to the solenoid 99 and thus move the valve 96 towards the right (Fig. 5) and introduce air under pressure above the piston 94 and force it down and thereby reset the air piston for the next correction. Since the limit switches 115, 122 and 126 are momentarily and serially actuated, the solenoids 98 and 99 are only momentarily energized and only long enough to permit the necessary air under pressure to actuate the piston. This slide valve system is not spring actuated and the piston valve remains in its last position until further moved by a solenoid.

The electric circuits are such that when the light from

the incandescent bulb 102 strikes the black or poorly reflective surface 101 on the case strip 15, the decrease in light reception varies the grid voltage of the amplifier tube 108 which governs the thyatron grid, provided the switches 115 and 122 are closed, and the resultant firing of the thyatron tube throws the normally closed relay 112 and causes the air cylinder to swing the lever 90.

The drum pins 116 and 120 are actuating the normally closed switches 115 and 122 periodically to open them momentarily, first the switch 115 to open the thyatron grid circuit and immediately thereafter the reset switch 122 which opens the circuit to the spring pressed relay switch 112 which is held closed when the thyatron conducts. If the photo tube energizes the thyatron when either switch 115 or 122 is open, and the length of the black mark 101 may span that part of the cycle, then the firing of the tube has no effect on the air cylinder and mechanical system. This condition prevails until the black mark 101 has crept so far ahead that the switch 115 is closed in its normal condition at the time of firing the photo tube. The overfeed timing is preferably such that some 15 or 20 or more cycles pass before correction is needed. Then, when the photo tube 100 fires by scanning the black mark before the switch 115 is opened, the system serves to operate the air cylinder and shorten the carriage stroke. The air piston 94 stays up under the air pressure until the normally open switch 126 is closed and causes the air piston valve 96 to shift. Then, when the next black spot 101 fires the photo tube, and if the switches 115 and 122 are still closed, the cycle of piston movement repeats. Thus the piston moves to shorten the carriage stroke as many times as are needed to secure registry and permit the photo tube to fire while the switches 115 and 122 are open or in synchronism with the photo tube firing.

When there is registry, the photo tube fires simultaneously with the opening of the thyatron grid circuit and the relay 112 is not actuated. If the photo tube scans the black mark before the switch 115 opens, then the correction cycle takes place. Thereafter, the switches 115 and 122 open in succession and reset the thyatron and relay. The piston chamber slide valve 96 remains in the position of holding the lever 90 up until the reset switch 126 is closed to cause the valve 96 to shift and lower the arm 90. The arm stays down until the slide valve is again moved. Hence, after every three cycles, the normally open switch 126 is closed so as to cause the piston 94, if up, to return and be ready for another up movement of lever 90. The actuation of lever 90 is thus caused at the end of each three cycles until registry is secured.

The effective length and stroke of the pitman connection to the clamp is shortened by decreasing the effective height of the swinging standard 60 and the arc of movement of its connection with the connecting rod 64. The eccentrics 68 and 86 are preferably set initially in their zero positions to be parallel or extending horizontally in the same direction, i.e., with the axis of each shaft and of its eccentric bearing in a horizontal plane. The air cylinder stroke is set to turn each eccentric substantially 30°, the upper eccentric rotating counter-clockwise and the lower one clockwise. This serves to raise the point of connection of the pitman 70 with the rocking standard 60 and decrease its throw of the standard. Also, the effective height of the standard 60 is lowered at its bearing connection with the rod 64. Thus, a given stroke of the pitman 70 will swing the standard 60 through a shorter arc, and that arc will be further decreased by the lowering of the axial center of the bearing on the eccentric 68. Hence, the stroke or the effective length and stroke of the connecting rod system is changed by decreasing the arc of stroke of the rocking standard 60.

The drive mechanism may be set as accurately as possible to feed the case strip at the correct rate, and any creeping ahead or slowing down in the strip feed may be

governed by two scanning systems, each of which is substantially the same as above described. One system has the photo tube circuit so set up that it corrects for a temporary overfeed by causing the eccentric to be so turned as to slow down the feed. The other scanning tube system is arranged to compensate for an underfeed, so that when the mark on the book strip indicates that the strip has lagged in its forward movement, this second tube system causes the eccentric to accelerate the case strip feed momentarily. Thus the two scanning systems will automatically cause the eccentric to be turned in such a direction as to compensate for any accidental overfeed or underfeed.

The apparatus, as above described, comprises a reciprocable clamp which is releasably engageable with the strip and serves to move the strip forward only in one direction when the clamp grips the same. A cutter is actuated in timed relationship with the clamp reciprocation. If the strip is moved by the reciprocating clamp mechanism so that it is either ahead or lags relative to registry with a reference device driven uniformly by the power driving mechanism, then the electronic scanning system causes the pneumatic device to turn the eccentric and compensate for the incorrect positioning of the case strip by speeding up the strip or slowing it down as is required to change an overfeed to an underfeed, or vice versa. The preferred construction is one in which there is a slight overfeeding of the strip, so that there is an increment variation in the strip feed. Each reciprocation of the clamp represents a very slight overfeeding. When there has been an accumulation of these increments which represents a limit of improper positioning of the strip, then the electronically controlled pneumatic mechanism serves to turn the eccentric, or the two eccentrics as illustrated, in such a direction as to eliminate that variation. This change in the rate of feed of the case strip takes place while the strip is in motion and does not require stopping the machine or otherwise interfering with the continuous forward feed of the strip. The electronic scanner, therefore, views the strip in its forward movement, and when a spot 101 being viewed is not in phase or registry with a power driven reference device, namely the switch 115 and the uniformly rotating contact member 116, the automatic mechanism serves to restore that registry. If the mark 101 is scanned when the switch 115 of the reference device is open, the power circuit is not affected. If the switch has not opened at the instant of mark scanning, then the solenoid 98 is energized to cause turning the eccentric to slow down the feed. The solenoid circuit is broken thereafter by the second switch 122 but the slide valve 96 remains stationary and causes the eccentric to remain in its speed slowing position until the slow speed switch 126 closes to slide the valve 96 and restore the piston operated lever 90 to its initial position and cause the eccentric to turn and restore the initial overfeed. Thus the system acts after an accumulation of overfeed increments to restore the strip to its correct feed position.

It will now be appreciated that various modifications may be made in the construction and that the above description of the preferred embodiment of the invention is not to be construed as imposing limitations on the appended claims.

We claim:

1. Apparatus for manufacturing book cases from a continuous book case strip having a series of cover boards applied in spaced relationship thereon, said apparatus comprising in combination a frame; a carriage reciprocally connected to said frame; constant-speed means for reciprocating said carriage relative to said frame; means on said carriage engaging said strip to move the same intermittently in one direction parallel to the axis of reciprocation of said carriage, said means for reciprocating said carriage comprising an oscillatory rock shaft pivotally connected to said frame, power-driven crank

means for oscillating said rock shaft, said crank means including a crank member, connecting rod means connecting said rock shaft to said carriage, said connecting rod means including at least one connecting rod member, and adjustable eccentric means connecting at least one of said members to said rock shaft, and means for automatically adjusting said eccentric means to vary the stroke of reciprocation of said carriage as a function of the linear speed of travel of the strip comprising a fluid pressure motor means connected to turn said eccentric means, electrically-controlled valve means controlling the direction in which fluid is admitted to said motor means, means operating said valve means to admit fluid to said motor means to operate the same from an initial position in a direction to adjust said eccentric means to shorten the stroke of reciprocation of said carriage, electronic scanning means secured to said frame for scanning said strip as it is fed thereby to detect uniformly-spaced reference marks thereon and for producing a voltage impulse upon the presence of each reference mark, comparison circuit means having an input connected to said scanning means and an output connected to said valve operating means and including means for producing an intermittent reference signal in synchronism with said power-driven crank means, said circuit means being operable when said voltage impulses are out of synchronism with the reference signal to operate said valve means to shorten the stroke of reciprocation of said carriage, and means for periodically resetting said motor means to its initial position.

2. In combination, an apparatus for manufacturing book cases from a continuous book case strip having a series of cover boards applied in spaced relationship thereon, said apparatus including a frame, a carriage reciprocally connected to said frame, constant-speed power-driven means for reciprocating said carriage relative to said frame, and means for moving the strip intermittently in one direction parallel to the axis of reciprocation of said carriage including clamp means on said carriage for releasably engaging the strip, and means for operating said clamp means to engage the strip on movement of said carriage in one direction and for releasing said clamp means from the strip on movement of the carriage in the opposite direction; the improvement wherein said means for reciprocating said carriage comprises an oscillatory rock shaft pivotally connected to said frame, power-driven crank means for oscillating said rock shaft, said crank means including a crank shaft and first adjustable eccentric means connecting said crank shaft to said rock shaft, connecting rod means connecting said rock shaft to said carriage, said connecting rod means including a connecting rod and second adjustable eccentric means connecting said connecting rod to said rock shaft; and means for automatically adjusting said first and second eccentric means to vary the stroke of reciprocation of said carriage as a function of the linear speed of travel of the strip comprising fluid pressure motor means connected to said eccentric means, electrically-controlled valve means controlling the direction in which fluid is admitted to said motor means, first solenoid means operating said valve means to admit fluid to said motor means to operate the same from an initial position in a direction to adjust said eccentric means to shorten the stroke of reciprocation of said carriage, electronic scanning means secured to said frame for scanning said strip as it is fed thereby to detect uniformly-spaced reference marks thereon and for producing a voltage impulse upon the presence of each reference mark, comparison circuit means having an input connected to said scanning means and an output connected to said first solenoid means and including a selector switch operable in synchronism with said power-driven crank means, said circuit means being operable when said voltage impulses are out of synchronism with the operation of said switch means to operate said first

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solenoid means, and means for periodically resetting said motor means to its initial position.

3. Apparatus as recited in claim 2 wherein said motor resetting means comprises second solenoid means operating said valve means to admit fluid to said motor means in a direction causing return of said motor means to its initial position, second circuit means for energizing said solenoid means and having a normally-open reset switch connected in series therewith, and means for periodically closing said reset switch at a rate lower than the rate of operation of said selector switch.

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