

May 2, 1950

R. N. WARD ET AL

2,506,004

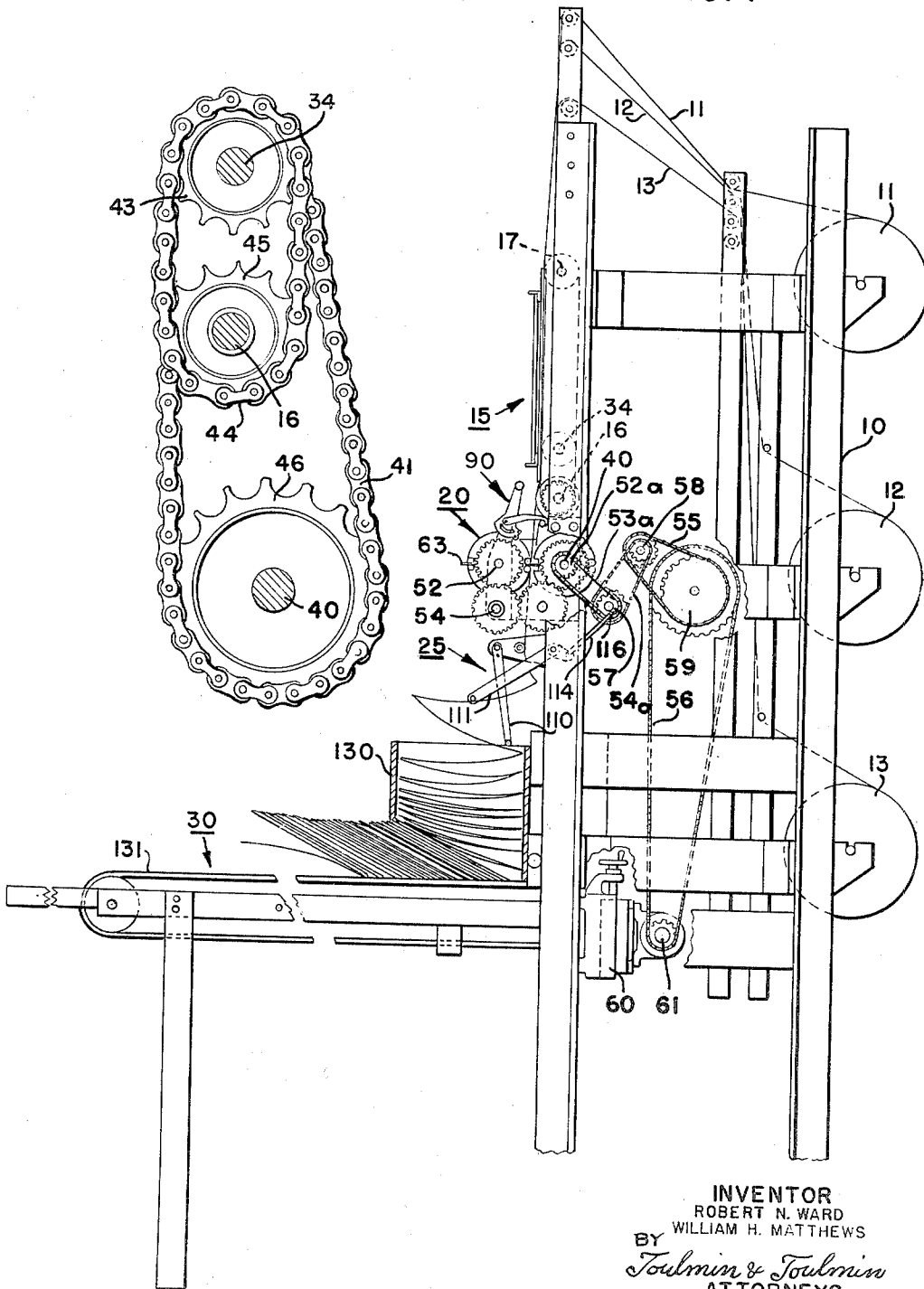
ALIGNING AND CREASING MECHANISM FOR PLURAL WEBS

Filed Nov. 9, 1945

5 Sheets-Sheet 1

FIG. 7

FIG. 1



INVENTOR
ROBERT N. WARD
BY WILLIAM H. MATTHEWS
Toulmin & Toulmin
ATTORNEYS

May 2, 1950

R. N. WARD ET AL

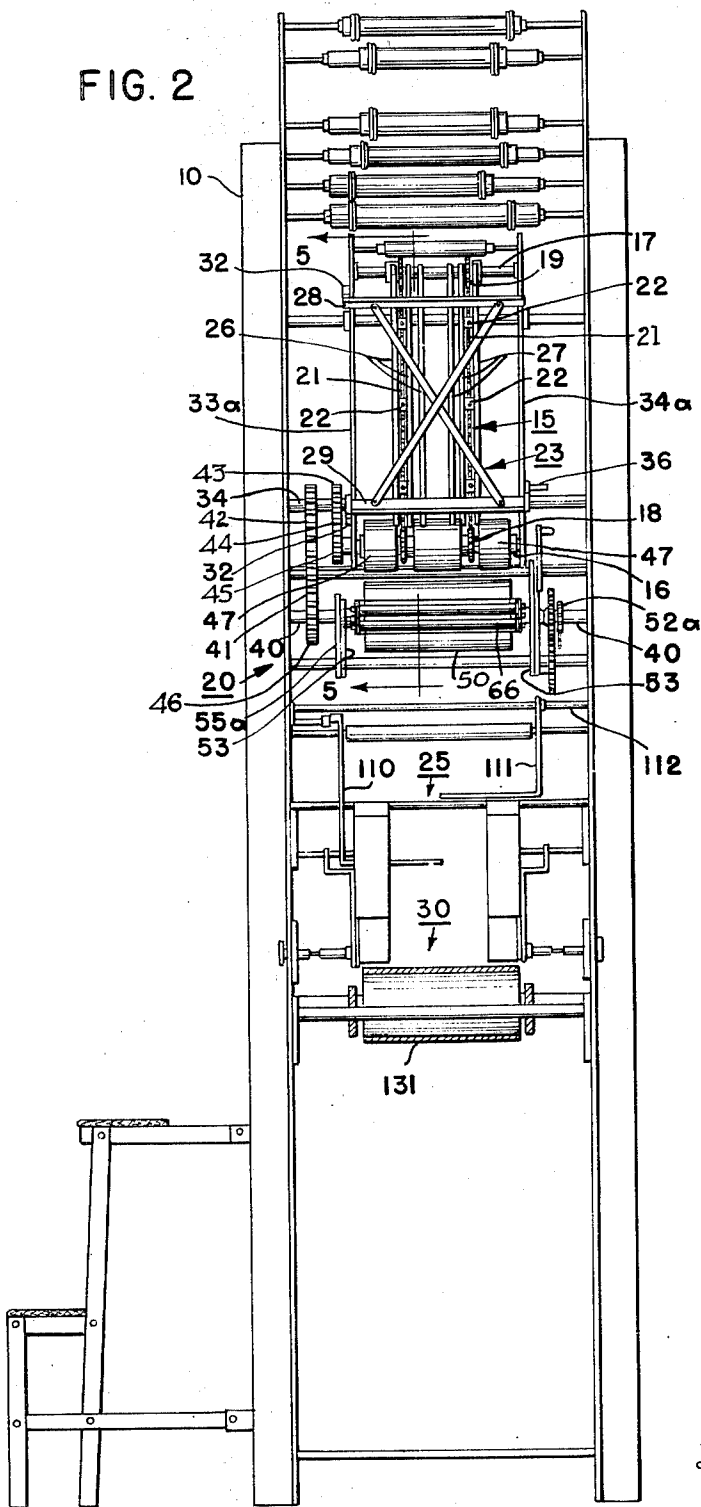
2,506,004

ALIGNING AND CREASING MECHANISM FOR PLURAL WEBS

Filed Nov. 9, 1945

5 Sheets-Sheet 2

FIG. 2



INVENTOR
ROBERT N. WARD
WILLIAM H. MATTHEWS
BY
Toulmin & Toulmin
ATTORNEYS

May 2, 1950

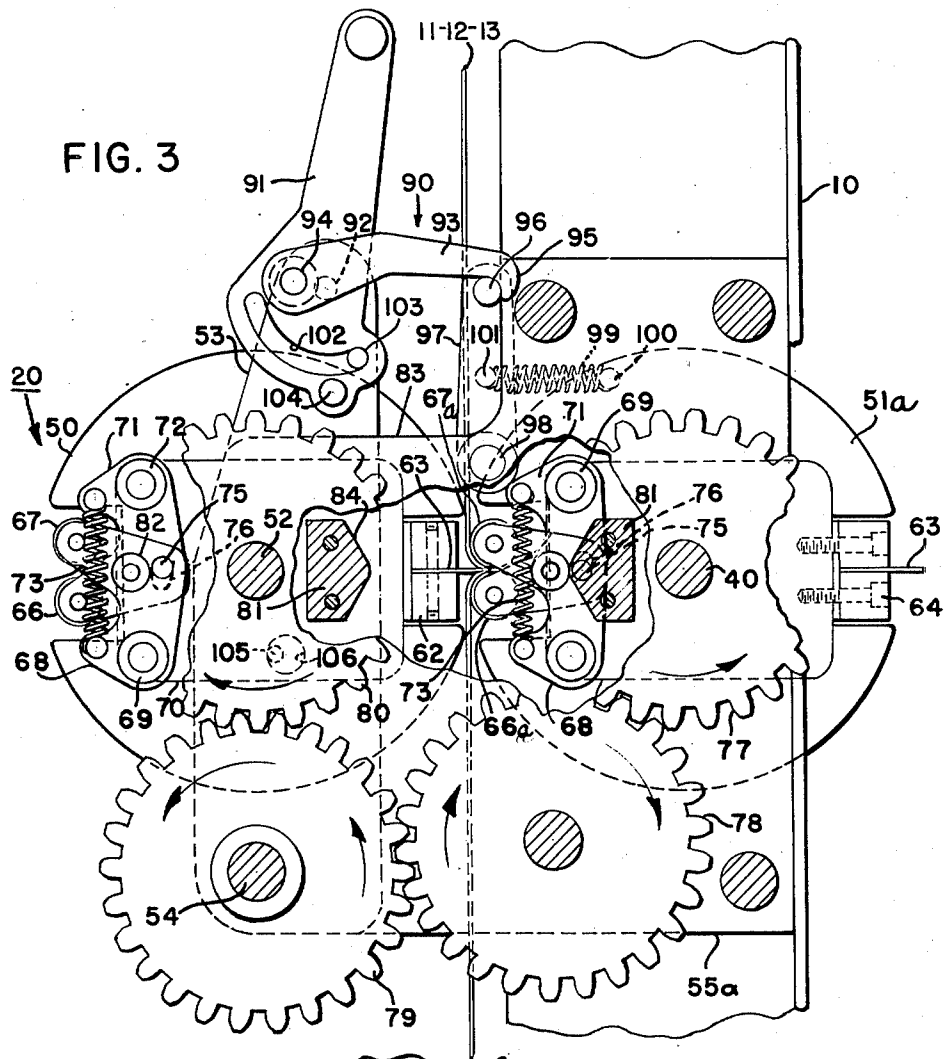
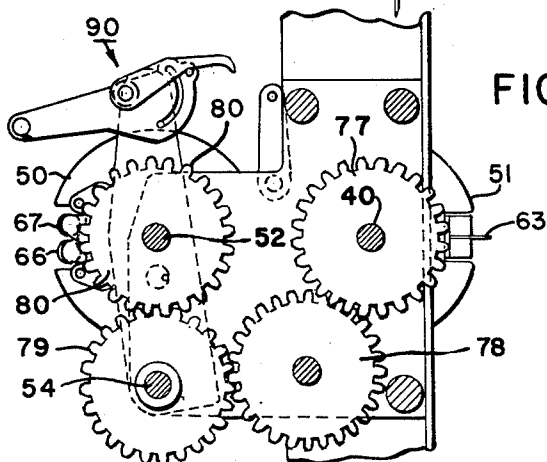
R. N. WARD ET AL

2,506,004

ALIGNING AND CREASING MECHANISM FOR PLURAL WEBS

Filed Nov. 9, 1945

5 Sheets-Sheet 3



INVENTOR
ROBERT N. WARD
WILLIAM H. MATTHEWS
BY
Toulmin & Toulmin
ATTORNEYS

May 2, 1950

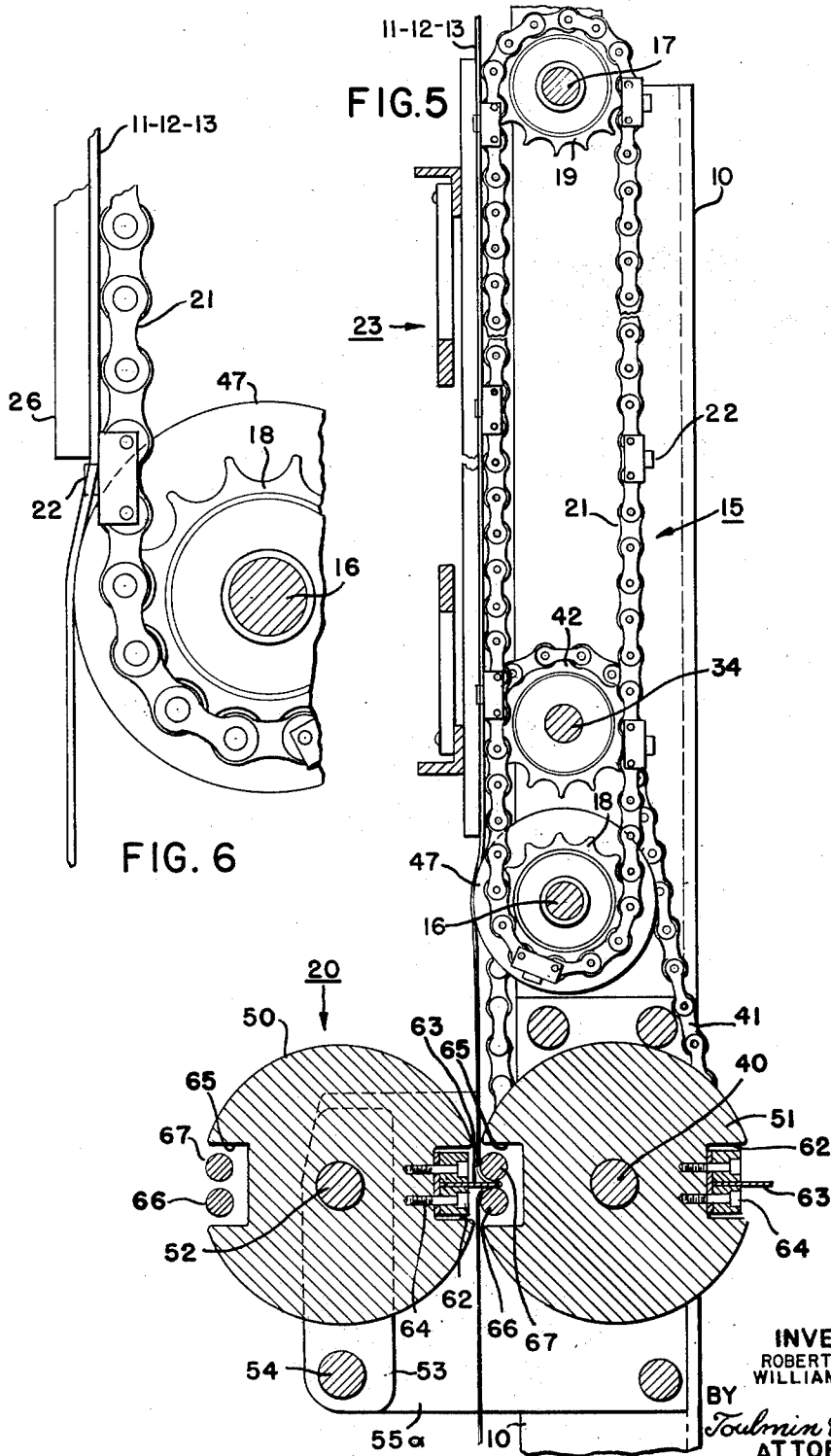
R. N. WARD ET AL

2,506,004

ALIGNING AND CREASING MECHANISM FOR PLURAL WEBS

Filed Nov. 9, 1945

5 Sheets-Sheet 4



INVENTOR
ROBERT N. WARD
WILLIAM H. MATTHEWS
BY
Toulmin & Toulmin
ATTORNEYS

May 2, 1950

R. N. WARD ET AL

2,506,004

ALIGNING AND CREASING MECHANISM FOR PLURAL WEBS

Filed Nov. 9, 1945

5 Sheets-Sheet 5

FIG. 10

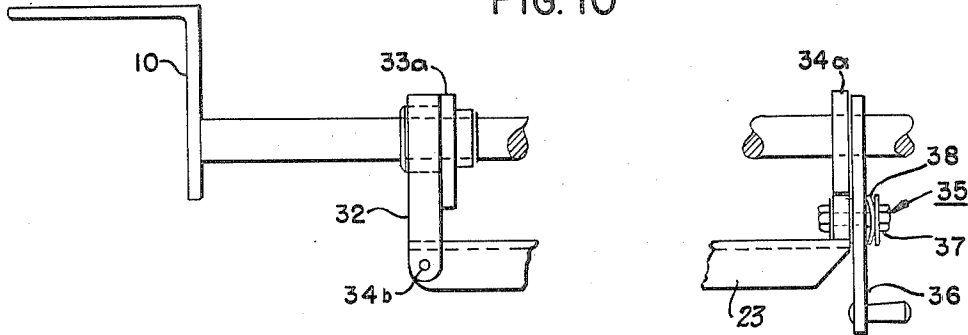


FIG. 9

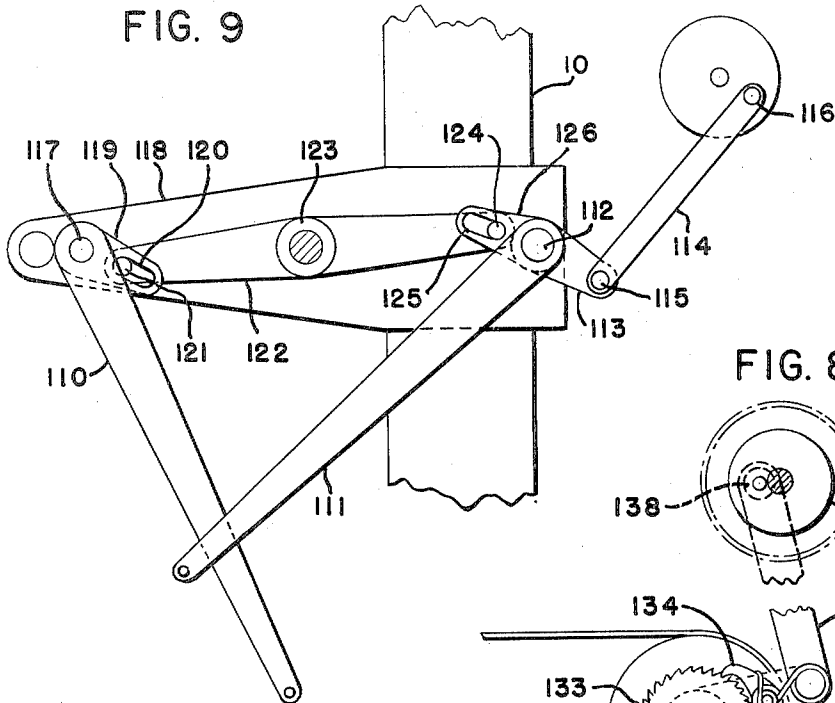
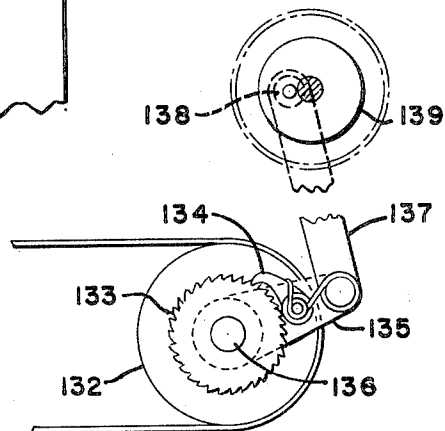


FIG. 8



INVENTOR
ROBERT N. WARD
WILLIAM H. MATTHEWS
BY
Toulmin & Toulmin
ATTORNEYS

UNITED STATES PATENT OFFICE

2,506,004

ALIGNING AND CREASING MECHANISM FOR
PLURAL WEBSRobert N. Ward and William H. Matthews, Day-
ton, Ohio, assignors to The Egry Register Com-
pany, Dayton, Ohio, a corporation of Ohio

Application November 9, 1945, Serial No. 627,648

4 Claims. (Cl. 270—39)

1

This invention relates to apparatus for collating, aligning and creasing continuous paper webs, and more particularly to an apparatus for creasing continuous webs at periodic intervals to obtain a fan-fold pack.

An object of the invention is to provide an aligning and creasing mechanism for producing fan-fold packs wherein the aligning mechanism for aligning individual sheets in the fan-fold pack, also provides the means for withdrawing the paper webs from supply rolls.

Another object of the invention is to provide an improved apparatus for creasing one or more webs of paper periodically in opposite directions to form a fan-fold pack wherein the creasing mechanism performs the creasing operation upon the paper webs while the webs are taut, thereby causing a sharp crease line therein.

Another object of the invention is to provide an aligning and creasing mechanism for one or more paper webs wherein the aligning mechanism mechanically holds and feeds the paper webs toward a creasing mechanism, and wherein the creasing mechanism is so constructed and arranged that the paper web or webs between the creasing mechanism and the aligning and feeding mechanism is placed in a taut condition by the creasing mechanism while the webs are mechanically held by the feeding and aligning mechanism to thereby produce a sharp crease line transversely of the webs by the creasing mechanism.

Still another object of the invention is to provide an improved creasing mechanism for creasing one or more paper webs wherein the webs have pressure applied thereto mechanically to bend the same over a creasing bar to thereby obtain a sharp crease line across the webs.

Still another object of the invention is to provide an improved creasing mechanism in accordance with the foregoing object wherein the means that applies mechanical pressure to the paper webs to bend the same over a creasing bar is caused to release the paper webs immediately after the creasing operation is complete, to thereby provide for freedom of movement between an aligning and feeding mechanism and a folding mechanism.

Further objects and advantages will become apparent from the drawings and the following description.

In the drawings:

Figure 1 is a side elevational view of a machine incorporating the features of this invention, certain parts of the frame thereof being broken away to more clearly illustrate the apparatus.

2

Figure 2 is a front elevational view of the machine illustrated in Figure 1.

Figure 3 is a side elevational view of the creasing mechanism of the machine illustrated in Figure 1, having parts thereof broken away to more clearly illustrate the operation and construction of the mechanism.

Figure 4 is a side elevational view, on reduced scale, of the mechanism illustrated in Figure 3, illustrating the manner in which the creasing mechanism can be opened to allow for threading of webs therethrough.

Figure 5 is a cross-sectional view of the machine taken substantially along line 5—5 of Figure 2.

Figure 6 is an enlarged elevational view of a part of the mechanism illustrated in Figure 5 showing the means by which the paper webs are released from the feeding and aligning mechanism.

Figure 7 is a side elevational view illustrating the driving mechanism for the feeding and aligning mechanism.

Figure 8 is an elevational view of the mechanism for driving the conveyor belt of the machine.

Figure 9 is an elevational view of the mechanism for folding the paper webs as they leave the creasing mechanism.

Figure 10 is an elevational view illustrating the frame that holds the paper webs against the feeding and aligning mechanism and illustrates the manner in which the frame is hinged to open away from the feeding and aligning mechanism to allow for threading of the machine.

In this invention the collating, aligning, creasing and folding mechanism consists generally of a frame 10 that carries the supply rolls 11, 12 and 13 of the paper webs that are to be collated, aligned, creased and folded by the mechanism of the machine of this invention. The webs 11 and 13 from the corresponding supply rolls may be termed record webs while the web 12 may be a web of carbon paper.

In many standard forms used in business, it is conventional to provide what is known as multiple copy forms wherein the copy sheets have imprinted on the webs replicate forms occurring periodically upon the length of the webs. A plurality of paper webs upon which the copy material is placed is then interleaved with webs of carbon paper therebetween. The interleaved copy and carbon paper webs are then adapted to be fed through a typewriter or autographic register or other business machines for producing multiple copies of original data.

In this invention the paper webs 11 and 13 and the carbon paper web 12 are withdrawn from the corresponding supply rolls by means of an aligning and feeding mechanism 15 which aligns the forms on the various webs with respect to one another and feeds them to a creasing mechanism 20 which in turn delivers the creased assembled webs to a folding mechanism 25 that fan-folds the webs for collection upon a conveyor belt 31. The various mechanisms 15, 20 and 25 are carried upon the frame 10 of the machine, and the conveyor 30 is adapted to convey the fan-fold forms to a suitable collecting station.

The feeding and aligning mechanism 15 is more particularly disclosed in Figures 5, 6 and 7. This mechanism consists of a pair of shafts 16 and 17 that carry the sprocket wheels 18 and 19 respectively. A sprocket chain 21 extends between the sprocket wheels 18 and 19, and is driven thereby. The shafts 16 and 17 of the feeding and aligning mechanism are suitably supported in a frame composed of vertical end plates 33-a and 34-a that are carried upon the main frame 10 of the machine.

As illustrated in Figure 2, there are two such sprocket chains 21 that are spaced some distance apart, and each of the chains 21 are provided with protruding pins 22 that are adapted to engage holes provided in the webs 11, 12 and 13 for withdrawing the webs from the corresponding supply rolls and for aligning the webs with respect to one another. The assembled paper webs 11, 12 and 13 are adapted to pass downwardly along the extended length of the chain 21, on the left hand side thereof, as illustrated in Figure 5, the pins 22 extending through the assembled paper webs, as shown. With the pins 22 passing through suitable holes in the paper webs, there is provided a positive mechanical driving connection to the paper webs 11, 12 and 13 for withdrawing the webs from the supply rolls 11, 12 and 13. Also, the pins 22 maintain positive alignment between the form faces on juxtaposed webs.

A gate 23 is positioned adjacent the length of the sprocket chain to engage the webs in engagement therewith for the purpose of retaining the paper webs in engagement with the sprocket chain with the holes in the webs maintained upon the pins 22 of the sprocket chain 21. The gate 23 consists generally of a rectangular frame structure having the guide bars 26 and 27 joined with the horizontal bars 28 and 29. Guide bars 26 and 27 positioned adjacent each side of each of the sprocket chains 21, see Figure 2, to insure engagement of the paper webs with the pins 22 on the chains 21. The gate 23, is hinged vertically by means of hinge blocks 32 that extend from the vertical end plates 33-a and 34-a respectively, the gate 23 being carried upon hinge pins 34-b as illustrated in Figure 10. A suitable latch 35 is provided for retaining the gate 23 in position adjacent the sprocket chains 21. The latch 35 may consist of an arm 36, pivotally carried upon a pin 37 that is friction engaged by a spring washer 38 which may be of the Belleville type. The arm 36 is provided with a slot that may extend over the shaft 34 to retain the gate in fixed position relative to the sprocket chains 21. It is of course, understood that other suitable latch mechanisms can be substituted for that disclosed.

The feeding and aligning mechanism 15 is driven from the creasing mechanism 20 and particularly from the shaft 40 of the creasing mechanism. The shaft 40 is suitably journaled

in the frame 10 and carries on one end thereof a sprocket wheel 45 that drives the sprocket chain 41 drivingly extending between the shaft 40 and the sprocket wheel 42 on the shaft 34. See Figure 5. The shaft 34 carries a second sprocket wheel 43, see Figure 7, that drives a sprocket chain 44 which in turn drives a sprocket wheel 45 on the shaft 16, for thereby driving the sprocket chains 21. The feeding and aligning mechanism 15 may thus be driven in synchronized relationship with the creasing mechanism 20.

As the paper webs approach the lower sprocket wheel 18 of the feeding and aligning mechanism, the webs engage rolls 47, carried upon the shaft 16, that disengage the paper webs from the pins 22, as illustrated in Figure 6. The paper webs are then free to pass to the creasing mechanism.

The creasing mechanism 20 consists of a pair of rolls 50 and 51, one of which is mounted upon a shaft 40 heretofore referred to, and the other roll 55 is mounted upon a shaft 52 carried between a pair of arms 53 that are pivotally mounted upon the shaft 54 extending between a pair of brackets 55 that are secured to the frame 10.

The shaft 40 carrying the roll 51 is provided with a sprocket wheel 52 thereon that is driven by a series of sprocket chains 53a, 54a, 55 and 56, that engage sprocket wheels 57, 58 and 59 respectively for drivingly connecting the shaft 40 with the power shaft 61 of a variable-speed drive 62 secured to the frame 10 of the machine.

Each of the rolls 50 and 51 of the creasing mechanism is provided with a recess 62 extending longitudinally thereof parallel to the axis of the roll that receives a creasing bar 63 therein. The creasing bar 63 is suitably retained in the recess 62 by means of screws 64. The creasing bar 63 extends beyond the periphery of the rolls 50 and 51 respectively, to engage the paper webs 11, 12 and 13 as they pass between the rolls 50 and 51. As will be noted in Figure 5, the creasing bars are adapted to alternately engage the paper webs 11, 12 and 13 and are on opposite sides of the paper webs to thereby cause alternate creasing of the paper webs in opposite directions so that the assembled webs can be fan-folded into a pack by the folding mechanism 25 hereafter described.

On the side of the rolls 50 and 51, diametrically opposite to the creasing bar 63 and the recess 62, there is provided in each of the rolls 50 and 51, a recess 65 that receives a pair of creasing rolls 66 and 67 therein that are adapted to cooperate with the creasing bars 63, as illustrated in Figures 3 and 5, to transversely crease the paper webs passing between the creasing bar 63 and the creasing rolls 66 and 67.

As illustrated in Figure 3 the creasing roll 67 is carried upon one end of a bell-crank lever 68 that is pivotally mounted upon the pivot pin 69 secured to the plate 70 attached to one end of the roll 50. The creasing roll 66 is carried upon one end of a corresponding bell-crank lever 71 that is pivotally mounted to the plate 70 by means of a pivot pin 72, the bell-crank lever 71 being disposed behind the bell-crank lever 68, as viewed in Figure 3. A tension spring 73 extends between the ends of the bell-crank levers 68 and 71, tending to rotate the bell-crank lever 68 in a clock-wise direction and the bell-crank lever 71 in a counter clock-wise direction to thereby cause the creasing rolls 66 and 67 to separate.

The degree of separation of the creasing rolls 66 and 67 is regulated by the pin 75 secured to the bell-crank lever 68 that rides in a slot 76 provided in the bell-crank lever 71. As shown in

Figure 3, the creasing rolls 66 and 67 are normally spaced apart a predetermined distance. The creasing rolls 66a and 67a carried upon the roll 51a are constructed and mounted in the manner just described with regard to the creasing rolls 66 and 67. It is of course, understood that the creasing rolls 66 and 67 are carried in the manner just described in both ends thereof.

The creasing roll 51 is driven directly by the shaft 40, and drives the creasing roll 50 through the train of gears 77, 78, 79 and 80, whereby the respective creasing rolls 50 and 51 are driven in the direction of the arrows thereon. With the creasing rolls driven in opposite directions, as indicated in Figure 3, it will be apparent that the creasing bar 63 of the roll 51 will cooperate with the rolls 66 and 67 on the roll 50 and the bar 63 on the roll 50 will cooperate with the rolls 66 and 67 on the roll 51, the latter cooperation being shown in Figure 3.

As the creasing bars 63 approach their cooperating rolls 66 and 67, thus providing nipper members, the paper webs 11, 12 and 13 will be engaged by the creasing bar 63 to force the same between the creasing rolls 66 and 67. When the creasing bar 63 and the creasing rolls 66 and 67 are in the position illustrated in Figure 3, the creasing rolls 66 and 67 are adapted to apply pressure upon the paper webs in an engagement with the edge of the creasing bar 63 to thereby sharply crease the same over the edge of the creasing bar.

The foregoing operation is performed by a cam plate 81 that is secured to the arm 55 as shown in Figure 3. The cam plate 81 is engaged by a roller 82 secured to the bell-crank lever 68. The cam plate 81 is secured to the frame plate 55—a but the frame plate 55a has been broken away in Figure 3 to illustrate the location of the cam plate 81.

When the roller 82 rides downward upon the upper cam face 84 of the cam plate 81, the bell-crank lever 68 is rotated about the pivot 69 to urge the creasing roll 67 toward the creasing roll 66. Simultaneously, the pin 75 on the bell-crank lever 68 causes rotation of the bell-crank lever 71 because of the engagement of the pin 75 with the slot 76 to urge the creasing roll 66 toward the creasing roll 67. This operation thus causes simultaneous movement of both creasing rolls 66 and 67 toward one another to clamp upon opposite sides of the creasing bar 63, as illustrated in Figure 3. It will therefore be apparent that rotation of the creasing rolls 50 and 51 will produce alternate and opposite creasing of the paper webs 11, 12 and 13 periodically along the length thereof as the webs pass beyond the rolls 50 and 51.

From the foregoing description it will be apparent that the assembled paper webs 11, 12 and 13 are mechanically fed and held by the feeding and aligning mechanism 15. Therefore, when the creasing bars 63 engage the assembled paper webs, the creasing bars will in effect wipe across the face of the web in engagement therewith as the creasing bars 63 approach their creasing position to produce a taut condition in the paper webs between the creasing bar 63 and the lowermost pin 22 of the feeding and aligning mechanism 15. This taut condition of the paper webs causes the webs to fold sharply over the edge of the creasing bar 63 when the creasing bar forces the paper webs between the creasing rolls 66 and 67. Thus, when the creasing rolls 66 and 67 operate to clamp upon the creasing bar on opposite sides thereof, as previously described, the

creasing rolls engage a taut paper condition to thereby sharply fold or crease the paper webs over the end of the creasing bar 63 and thereby obtain a well defined fold line transversely across the paper webs.

To allow for threading of the paper webs 11, 12 and 13 between the creasing rolls 50 and 51, the creasing roll 50 is carried upon the pivoted arms 53 as heretofore described, so that the roll 50 can be moved away from the roll 51 during the threading operation.

A resilient latching device, 90, is provided for retaining the arms 53 in position illustrated in Figure 3. This latching device consists of an actuating handle 91 that is pivotally mounted upon the arm 53 upon a pin 92. The arm 91 carries a latch arm 93 pivoted upon the arm 91 by means of a pin 94. The free end of the latch arm 93 is provided with a hook 95 that extends over a latch pin 96 carried in an arm 97 that is pivoted upon a pin 98 carried in the frame of the machine and resiliently urged in a clock-wise direction by means of a tension spring 99 that extends between the pin 100 in the frame of the machine and the pin 101 in the arm 97.

The actuating arm 91 is provided with an arcuate slot 102 that rides over a pin 103 secured in the frame arm 53. The arm 91 also carries a pin 104 that is adapted to engage the latch arm 93 to release the hook 95 from the pin 96 when the actuating arm 91 moves in a counter clock-wise direction. A stop pin 105 is carried in the frame 83 of the machine and extends into a hole 106 provided in the arm 53 to control the opening and closing movement of the roll 50. With the device in the position illustrated in Figure 3, it will be apparent that the roll 50 is resiliently retained in its position by means of the spring 99 drawing the arm 53 against the stop pin 105.

When the assembled paper webs leave the creasing mechanism 20, the webs are provided with alternate and opposite fold lines as illustrated in Figure 1. The folding mechanism 25 is provided for insuring proper fan-fold folding of the paper webs as they leave the creasing mechanism 20. The folding mechanism 25 consists of a pair of arms 110 and 111 that are adapted to oscillate back and forth to alternately engage the creased paper webs as they discharge from the creasing mechanism 20. The arm 110 sweeps in a leftward direction as viewed in Figure 1, to urge the creased web downward to insure folding along the right hand fold line while the arm 111 sweeps across the paper webs in a right hand direction to urge the paper webs to fold along the left hand fold line. The arm 111 is secured to a shaft 112, see Figure 9, that has attached thereto a link 113 that is engaged by a link 114 pivotally secured thereto by means of a pin 115. The opposite end of the link 114 engages a pin 116 positioned eccentrically upon the sprocket gear 57 to thereby produce oscillation of the shaft 112 and of the arm 111.

The arm 110 is pivotally carried upon a shaft 117 secured to the bracket 118. A link 119 is also secured to the shaft 117 and has a slot 120 therein engaging a pin 121 secured on one end of a lever 122 pivoted on a pin 123 mounted in the bracket 118. The opposite end of the lever 122 carries a pin 124 that engages a slot 125 provided in a link 126 that is secured to the shaft 112, whereby the link 126 is oscillated by the shaft 112 and which oscillation of the link 126 causes oscillation of the lever 122 through the pin 124 and thus in turn

causes oscillation of the arm 110 through the pin 121 and the link 120.

From the foregoing description of the fold mechanism 25 it will be apparent that it is synchronized in its operation with the discharge of the creased paper webs moving from the creasing mechanism 20.

The fan-folded paper webs drop into a box 130 positioned over the conveyor 30, the webs being discharged from the box 130 by movement of the conveyor 30.

The conveyor 30 consists of a belt 131 that may be driven continuously by suitable gearing from the variable speed drive 60 to synchronize the movement of the belt 131 with the feeding operation of the machine or the conveyor belt 131 may be driven intermittently by means of a mechanism illustrated in Figure 8. In this arrangement one of the conveyor pulley wheels 132 is provided with a ratchet gear 133 attached to the same. A ratchet pawl 134 is pivotally mounted upon a lever 135 that is pivotally mounted upon the shaft 136 and is oscillated by means of a lever arm 137 attached to a pin 138 positioned eccentrically upon a drive wheel 139. The drive wheel 139 may be positioned upon any continuously rotating shaft driven by the variable speed drive 60 to synchronize the movement of the belt with feeding of the paper webs through the machine. Oscillation of the arm 135 causes the ratchet pawl 135 to periodically rotate the pulley wheel 132 and thus intermittently drive the conveyor belt 131 to give it a jogging action which tends to settle the fan-folded stack into a closely packed condition as illustrated in Figure 1.

From the foregoing description it will therefore be seen that in the collating, aligning, folding and creasing mechanism of this invention the aligning mechanism 15 which aligns the paper webs by means of periodically spaced perforations provided in the webs, also produces the feeding operations for withdrawing the webs from the supply rolls. The mechanical holding of the paper webs by the aligning holes therein provides means whereby a taut paper web condition is developed between the aligning mechanism 15 and the creasing mechanism 20 during the creasing operation, and just prior thereto, so that a sharp fold line is obtained transversely across the paper webs. Also, the folding operation insures a positive fan-fold folding of the creased paper webs to properly stack the same upon a conveyor.

While the apparatus disclosed and described herein, and the method of collating, aligning, creasing and folding the paper webs as produced by the apparatus, constitutes a preferred form of the invention, yet it will be apparent that the apparatus, as well as the method, is capable of modification without departing from the spirit of the invention and that all modifications that fall within the scope of the appended claims are intended to be included herein.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent is:

1. An apparatus for collating and folding multiple copy fan-fold forms that includes, an aligning mechanism having pins therein for engaging holes in a plurality of webs adapted to pass thereover for aligning the webs and for withdrawing the webs from supply rolls, a creasing mechanism for receiving the paper webs from the aligning and feeding mechanism in a straight line movement therethrough, said creasing mechanism having a creasing bar and a pair of rolls

cooperating therewith for movement into engagement with the opposite sides of the paper webs passing through the creasing mechanism to temporarily disrupt the straight line movement through the creasing mechanism and cause the webs to be placed in a taut condition between the creasing mechanism and the aligning mechanism simultaneously with producing a substantially V-shaped fold therein for creasing the paper webs while in a taut condition.

2. An apparatus for collating and folding multiple copy fan-fold forms that includes, an aligning mechanism having pins therein for engaging holes in a plurality of webs adapted to pass thereover for aligning the webs and for withdrawing the webs from supply rolls, a creasing mechanism for receiving the paper webs from the aligning and feeding mechanism in a straight line movement therethrough, said creasing mechanism having a creasing bar and a pair of rolls cooperating therewith for movement into engagement with the opposite sides of the paper webs passing through the creasing mechanism to temporarily disrupt the straight line movement through the creasing mechanism and cause the webs to be placed in a taut condition between the creasing mechanism and the aligning mechanism simultaneously with producing a substantially V-shaped fold therein for creasing the paper webs while in a taut condition, said creasing mechanism having said bar and cooperating rollers positioned therein for alternately and oppositely engaging the paper webs passing through the creasing mechanism to alternately and oppositely crease the same for thereby producing a fan-fold arrangement of the webs.

3. An apparatus for collating and folding multiple copy fan-fold forms that includes, an aligning mechanism having a plurality of pins thereon for engaging periodically spaced holes in juxtaposed position during movement thereof to a creasing mechanism, and a creasing mechanism for receiving the aligned paper webs from the aligning and feeding mechanism in a straight line movement and consisting of, a pair of rotatable members rotatable in opposite directions each having a creasing bar positioned on the same relative side thereof, a pair of cooperating rolls on each of said rotatable members carried thereby on diametrically opposite sides from the position of said creasing bars, the creasing bars of one rotatable member being adapted to cooperate with the rolls of the other rotatable member for forcing the paper webs between the said rolls and thereby crease the paper webs alternately and oppositely, resilient means engaging each pair of cooperating rolls holding said rolls in spaced relationship to receive said bar, and cam means operatively engaging said rolls moving them together into a predetermined spaced relationship and into engagement with said bar when fully therebetween to crease the webs between said rolls and said bar.

4. An apparatus for collating and folding multiple copy fan-fold forms that includes, an aligning mechanism having pins therein for engaging holes in a plurality of webs adapted to pass thereover for aligning the webs and for withdrawing the webs from supply rolls, a creasing mechanism for receiving the paper webs from the aligning and feeding mechanism in a straight line movement therethrough, said creasing mechanism having nipper members for movement into engagement with the opposite sides of the paper webs passing through the creasing mechanism to

temporarily disrupt the straight line movement through the creasing mechanism and cause the webs to be placed in a taut condition between the creasing mechanism and the aligning mechanism simultaneously with producing a substantially V-shaped fold therein for creasing the paper webs while in a taut condition.

ROBERT N. WARD.

WILLIAM H. MATTHEWS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,108,295	Wildman -----	Aug. 25, 1914
1,326,987	Straubel -----	Jan. 6, 1920
1,497,296	Jappe -----	June 10, 1924
1,699,165	Sherman et al. -----	Jan. 15, 1929
2,246,336	Wyrick -----	June 17, 1941