March 24, 1959 A. J. TERZUOLI ET AL 2,878,496

METHOD OF AND APPARATUS FOR BOOKBINDING

Filed June 14, 1957 4 Sheets-Sheet 1

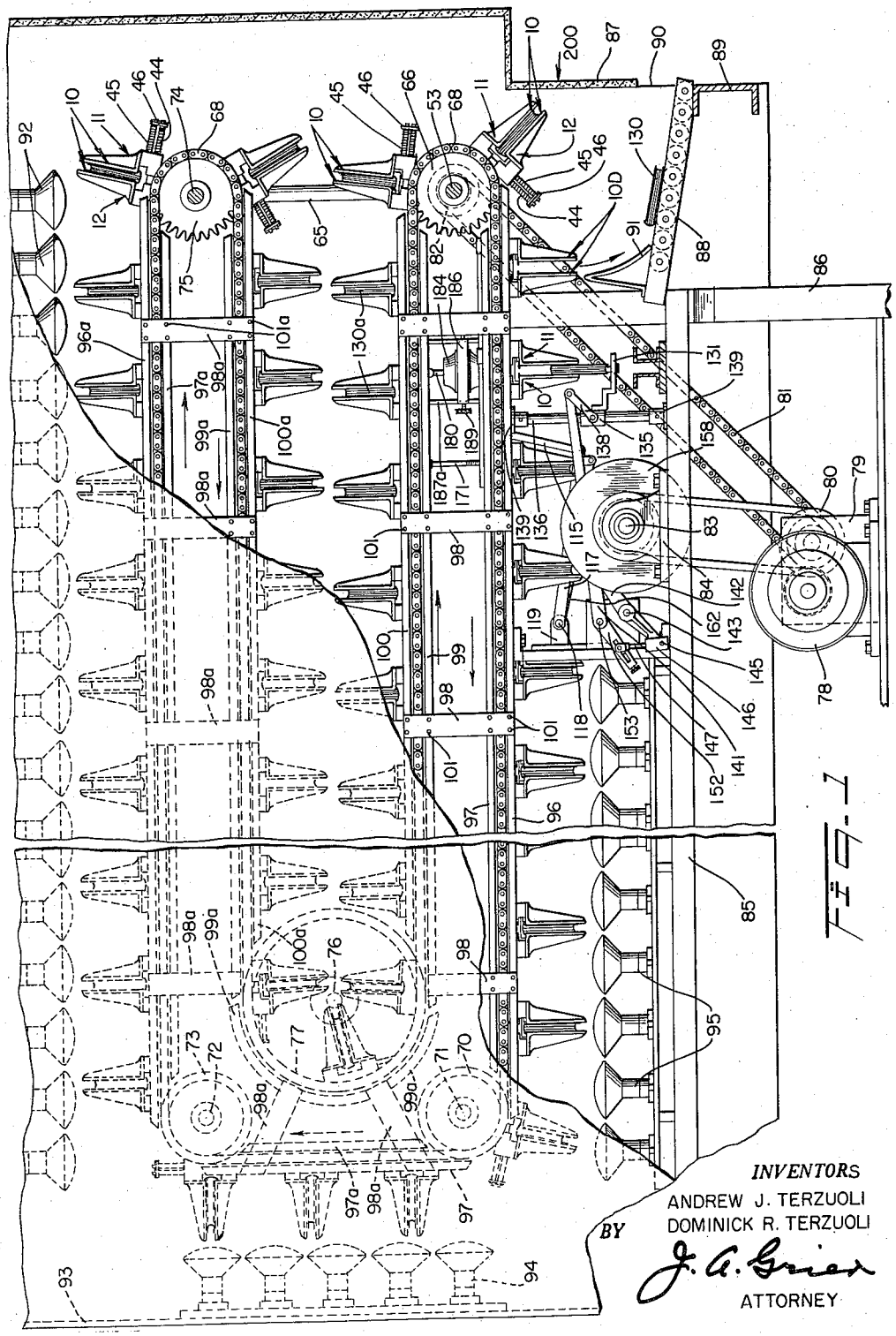


FIG. 1

INVENTORS
ANDREW J. TERZUOLI
DOMINICK R. TERZUOLI
BY J. A. Grier
ATTORNEY

March 24, 1959 A. J. TERZUOLI ET AL 2,878,496

METHOD OF AND APPARATUS FOR BOOKBINDING

Filed June 14, 1957 4 Sheets-Sheet 2

Fig. 2

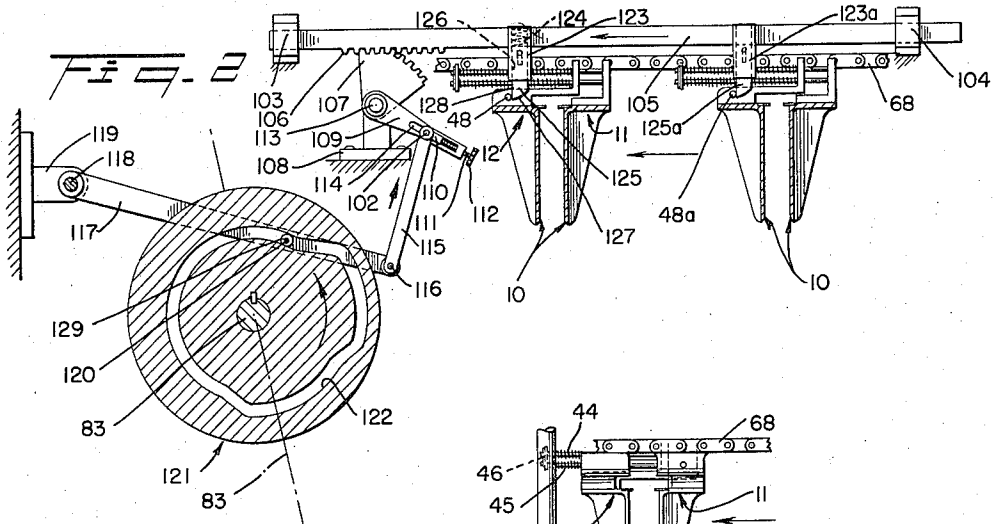


Fig. 3

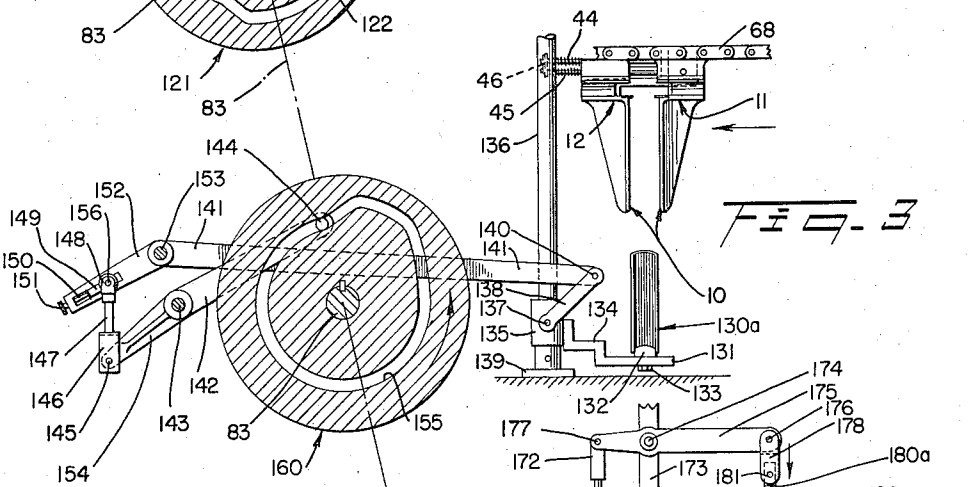


Fig. 4

INVENTORS

ANDREW J. TERZUOLI

DOMINICK R. TERZUOLI

BY J. A. Grier

ATTORNEY

March 24, 1959 A. J. TERZUOLI ET AL 2,878,496

METHOD OF AND APPARATUS FOR BOOKBINDING

Filed June 14, 1957 4 Sheets-Sheet 3

Fig. 5

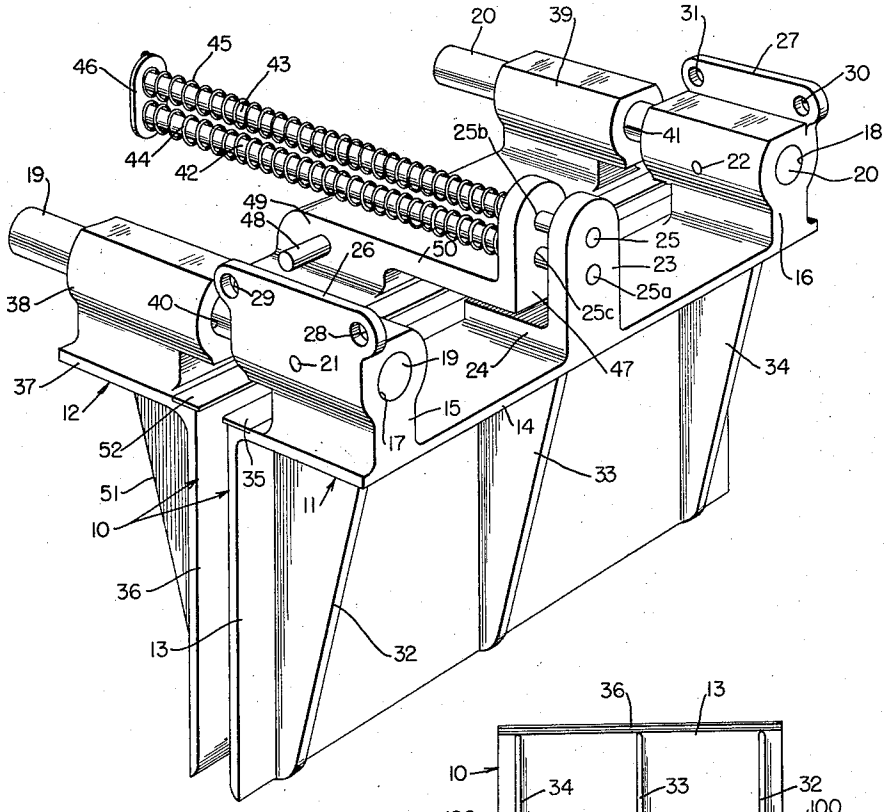
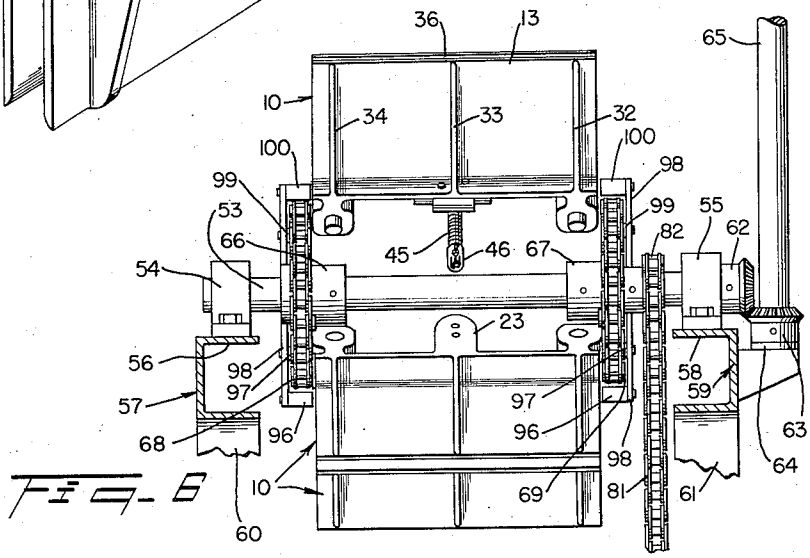


Fig. 6



INVENTORS
ANDREW J. TERZUOLI
DOMINICK R. TERZUOLI

BY J. G. Brenner

ATTORNEY

March 24, 1959 A. J. TERZUOLI ET AL 2,878,496

METHOD OF AND APPARATUS FOR BOOKBINDING

Filed June 14, 1957 4 Sheets-Sheet 4

Fig. 7

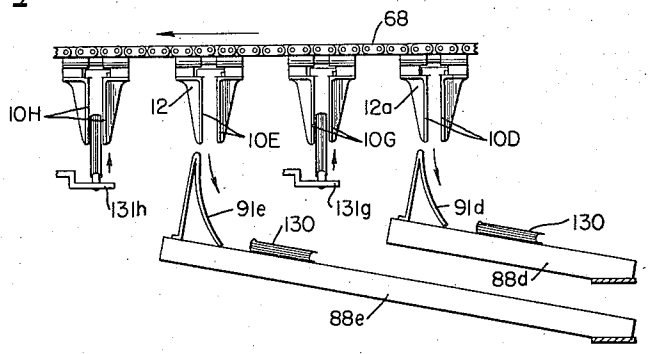
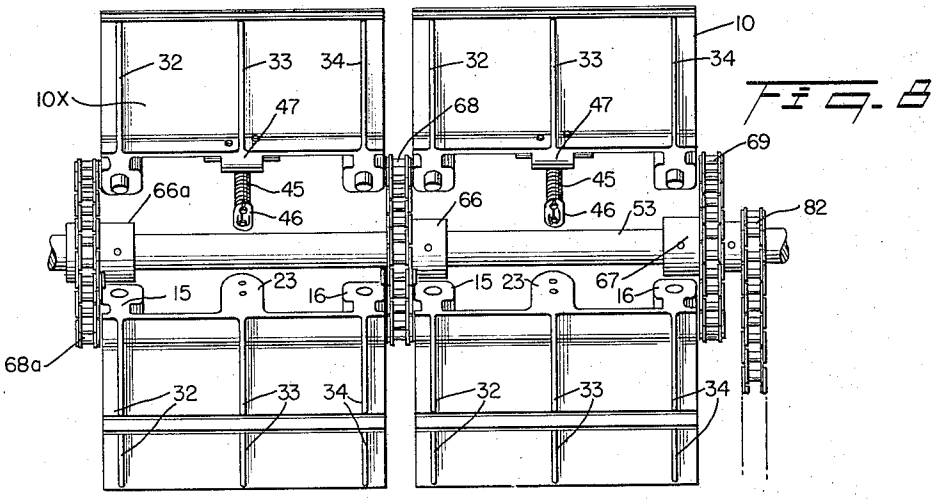


Fig. 8



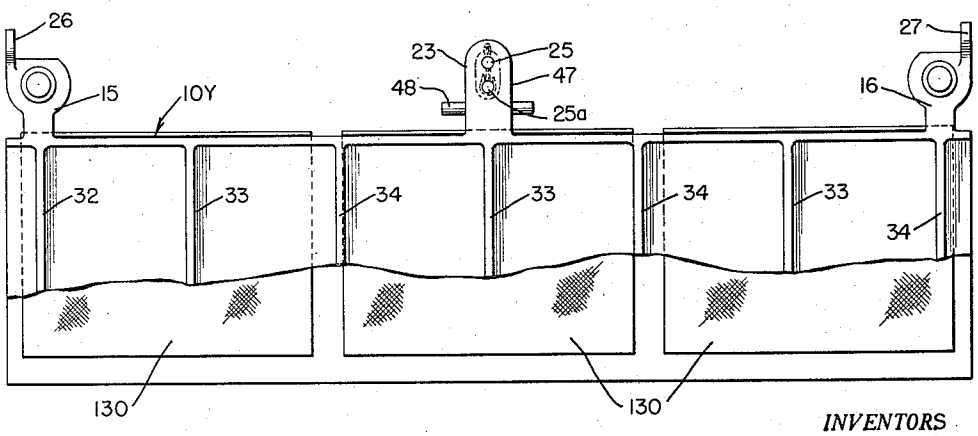


Fig. 9

INVENTORS
ANDREW J. TERZUOLI
DOMINICK R. TERZUOLI
BY J. A. Grier
ATTORNEY

United States Patent Office 2,878,496 Patented Mar. 24, 1959

2,878,496

METHOD OF AND APPARATUS FOR BOOKBINDING

Andrew J. Terzuoli and Dominick R. Terzuoli, Brooklyn, N.Y.

Application June 14, 1957, Serial No. 665,853

22 Claims. (Cl. 11—1)

This invention relates more particularly to improved apparatus for automatically performing bookbinding operations.

Another object of the invention is the provision of a novel drying oven, wherein endless carriers are guided over a constant path and these carriers support and convey a large number of our new and improved book conveying clamps along said path in said oven.

Yet another object of the invention is the provision in an oven of the character described of feeding means to sequentially feed books to be processed into opened clamps as they arrive at a loading station from a previously encountered discharge station where the finished books are discharged from said oven. The clamps remain unclamped from the time of discharge until they reach a receiving station.

A further object of the invention is the provision of means to control the clamping of the received books at the loading station after they are received and properly positioned in an unclamped clamp in registration with said feeding means.

Still another object of the invention is the provision of an improved book clamping member comprised of a pair of plates or jaws reinforced with ribs and adapted to flatly press against the front and the back covers of a book, beading elements on each plate or jaw for forming the joints of the book, and means for contacting and forming the material between said joints with a neat and clean-cut arc or curve.

Another object of the invention is the provision of cooperative guide means common to both said plates or jaws and lying on a plane 90° with respect to the plane of the plates or jaws, spring means urging said plates toward each other, and means acting against said spring means for opening said jaws.

A further object of the invention is the provision of a conveyor system comprised of three parallel chains carried on sprockets, two sets of plates or jaws commonly supported by the middle of the three chains and individually supported by the outside chains, and double or tandem (in a lateral sense) unloading and loading stations for removing finished books from and delivering unfinished books to said system.

Yet another object of the invention is the provision of cooperative clamping jaws adapted to handle a plurality of books at one time instead of a single book, as is the case with the jaws in the first embodiment described herein.

Other objects and advantages of the invention will be apparent to those skilled in the art upon a study of this specification and the accompanying drawings.

Referring to the drawings, which are given by way of example to illustrate the invention:

Figure 1 is an elevation, partly broken away, showing our improved drying oven which requires comparatively small floor space, and yet handles a surprisingly large number of books per hour;

Figure 2 is an elevation showing an improved means for releasing books from our improved clamping jaws;

Figure 3 is an elevation of a loading station showing a pair of released jaws in registration therewith and showing means to elevate an unfinished book into said jaws;

Figure 4 is an elevation showing a centralized back former for engaging the edge of the book between beading elements on said jaws;

Figure 5 is a perspective view of our improved clamping jaws carrying common guides and having spring means urging said jaws toward one another;

Figure 6 is an elevation showing spaced sprockets carried on a common shaft and supporting and conveying the improved clamping jaws;

Figure 7 is a fragmentary view of an oven having spaced discharge stations and spaced feed in stations therebetween;

Figure 8 is an end view of a three conveyor chain arrangement in a tandem oven wherein the middle chain commonly supports both sets of clamping jaws and where one set of the latter are connected to one outer chain and the other set of the latter are connected to the other outer chain; and

Figure 9 is an elevation of a multi-clamp pair of jaws for handling a plurality of books.

Referring first to Figure 5, our book clamping unit **10** is comprised of cooperative clamping elements **11** and **12**. The element **11** is comprised of a vertical plate portion **13** having a plane book engaging surface joining to a flange portion **14** which extends 90° with respect to the plate portion **13**.

The flange portion carries a boss portion **15** near one end thereof and a boss portion **16** near the other end thereof. Each of these boss portions have holes **17** and **18** respectively to accommodate shaft members **19** and **20** which are secured therein in any suitable manner, as by means of headless set screws **21** and **22** respectively.

On the flange portion **14** between the boss portions **15** and **16** is an upstanding boss **23** having a foot portion **24**. The function of the boss **23** and its foot portion will be presently described.

The boss portion **15** carries an elongated boss **26** which is generally parallel to the axis of the shaft hole **17** and it also carries spaced apart substantially parallel holes **28** and **29** for attachment to a conveyor chain, as will presently be described. The boss portion **16** also carries a like elongated boss **27** which has spaced apart holes **30** and **31** therein.

To stiffen the vertical plate portion, reinforcing ribs **32**, **33**, and **34** are provided thus rendering said portion light in weight and also extremely rigid.

Secured to the flange portion **14** in overhanging relation to the plate portion is a guide member **35** which functions to guide a book between the jaws, and also to partially form and shape the book, as will hereinafter be described.

The cooperative clamp element **12** has a depending plate portion **36** formed integral with a flange portion **37**, and this plate portion **36** is parallel to the plate portion **13**, due to the fact that the flange portion **37** carries bosses **38** and **39**, which are spaced apart and these bosses have accurate holes **40** and **41** therein to accommodate the shafts **19** and **20**.

Between the bosses **38** and **39** on the flange portion **37** is a boss **49** having a forwardly extending portion **50** which clears the foot portion **24** and carries an upstanding boss **47** which is coextensive with the upstanding boss **23**.

Formed in the bosses **23** and **47** are aligned holes, one set of which is shown at **25**, **25***a* in Figure 5. Mounted in these holes are parallel shafts which fit the holes **25**

and 25*a* snugly and which are fixed therein. The holes 25*b* and 25*c* form a working fit on the shafts 42 and 43. The shafts 42 and 43 carry helical springs 44 and 45 respectively and the extremities of these shafts are secured in a plate member 46 in which the extremities of both shafts are fixed.

A hole formed in the boss 49 carries a stub shaft 48. The springs 44 and 45 push against the plate member 46 on one end and push against the boss 47 on the other end and tend to urge the boss 47 toward the boss 23. Now if the stub shaft 48 were moved toward the rear of Figure 5 the plate 36 would tend to move away from the plate 13 and a finished book would pass from between these plates.

Secured on the flange portion 37 is a second guide member 52 and it has a portion overhanging the plate portion 36 in the same manner as the guide member 35 did the plate portion 13.

The plate portion 36 and the flange portion 37 are joined together by reinforcing webs, one of which is shown at 51 for rendering the combined plate and flange element as rigid as possible.

A shaft 53 is journaled in bearings 54 and 55, which are mounted on U channels 57 and 59, 54 being carried on the channel portion 56, while the bearing 55 is mounted on the channel portion 58. The channel 57 is carried on an upright member 60, while the channel 59 is carried on an upright support 61, and supported on a thrust bearing 64.

A miter gear 62 is keyed on the shaft 53 and meshing with this gear is a second miter gear 63 which is keyed on a driven shaft 65.

Keyed on the shaft 53 are identical sprockets 66 and 67. These sprockets are spaced apart from each other and a plurality of them are included in the array shown in Figure 1 as will be explained in connection with that figure.

A chain 68 is meshed with the sprocket 66 on the shaft 53, and this chain also passes around a sprocket 70 which is carried on a like shaft 71 preferably in horizontal alignment with the shaft 53. In vertical alignment with the shaft 71 is a shaft 72 journaled on suitable bearings and carrying a sprocket 73 around which the chain 68 is passed. In horizontal alignment with the shaft 72 is a shaft 74 which carries a sprocket 75, and the chain 68 also passes around it, and thence it passes around a larger sprocket 77 which is journaled in bearings carried on frame members of the oven 200. The sprocket 77 has its upper periphery in alignment with the lower periphery of the sprocket 75 and its lower periphery is in alignment with the upper periphery of the sprocket 66. By this arrangement, I am able to provide a drying oven for the books which will handle a maximum number of books for the floor space required for the oven.

From Figure 6, it will be seen that the shaft 53 also carries a second spaced apart sprocket 67 around which passes a second chain 69. The shafts 71, 72, 74 and 76 all have keyed thereon sprockets like the sprockets 70, 73, 75 and 77, respectively.

The lug 27 (Fig. 5) has its holes 30 and 31 spaced so that bolts or screws can pass therethrough and engage the chain 69. Likewise the lug 26 has its holes 28 and 29 spaced to carry mounting screws adapted to engage the chain 68. Each clamping unit is mounted on the two chains 68 and 69 in the same manner, and only sufficient clearance space is provided between the clamping units.

Returning to Figure 1, an electric motor 78 drives a reduction gear 79 which carries a sprocket 80. A drive chain 81 spans the sprocket 80 and it meshes with a sprocket 82 carried on the shaft 53.

A shaft 83 is journaled in suitable bearings, one of which is shown at 84, as secured to a cross frame member 85 in the drying oven and secured on the shaft 83 are elements which will presently be described in connection with Figures 2, 3 and 4.

The drying oven also has an upright supporting member 86 which with the portion of the oven wall 87 defines an exit passage. An inclined conveyor 88 of the roller type has one end secured to the frame member 85 and the other end is secured to the frame member 89 at the exit opening 90.

To provide substantially level surfaces over which the chains 68 are carried, a series of elongated bars 96 is provided, and the chains follow along the upper surfaces thereof. Also to maintain uniformity of the action of the chain, a second series of elongated bars 97 is provided closely adjacent to and above the chains. The bars 96 and 97 are maintained in this relation by tie strips 98, which in Figures 1 and 6 are fixed to stationary elements in the oven (not shown) and also fixed to the bars 96 and 97 by means of screws or rivets 101.

These tie strips are also secured to elongated bars 99 and 100 with the chain 68 therebetween, fastening screws or rivets 101 being employed for that purpose.

Figure 1 also shows another loop of the chain 68 between spaced elongated bars 99*a*, 100*a*, which are secured to tie strips 98*a* which are also secured to elongated bars 97*a*, 96*a* by means of screws or rivets 101*a*, the tie strips also being secured at spaced intervals (not shown) to insure both good support and structural rigidity.

An upright guide 91 which somewhat resembles an inverted V functions to guide the finished books onto the rollers of the conveyor 88. The books from the clamping units, in the position immediately above the guide 91, are moved in a manner to disengage the books and this movement will be presently described.

Within the drying oven near the top thereof is a series of infra red lamps designated by the numeral 92 and the number of infra red lamps in this group depends on the length of the oven since the lamps are mounted close together with a reasonable clearance therebetween.

On the wall 93, which is the left end of the oven as seen in Figure 1, is carried a group 94 of infra red lamps and the cross frame member 85 supports a group of infra red lamps, designated by the numeral 95.

The heat generated by these lamps and the speed of the books in passing through the drying oven is such that each book which effects a transit therethrough is properly dried.

In Figure 1, the clamping units 10, after they have traversed the oven, finally arrive at the position 10D where they are released and are discharged in a manner best seen in Figure 2.

Coextensive with the chain 68, near the discharge station is a bar 105 which is preferably substantially parallel to the said chain, and the bar 105 is reciprocally carried in bearings 103 and 104. The bar 105 carries a series of rack-like teeth 106 with which a sector 107 meshes.

The sector 107 is fixed on a shaft 113, and secured to it is an actuating lever 109, which has an elongated slot 114 formed therein. A block member 110 is slidably carried in this slot and it has a threaded hole therein through which a screw 111 extends, threadedly engaging the threads in said hole the outer end of the screw 111 has a knurled knob head 112. The block 110 carries a stud 102 upon which a hole in one end of a lever 115 is journaled. The shaft 113 is journaled in a bearing 108, suitably supported in the oven structure.

A lever 117 has one end connected to a shaft 118 which is journaled in a bearing 119 in the oven structure. The other end of this lever is bifurcated and is connected to the other end of the lever 115 by means of a clevis pin 116 extending through aligned holes in the bifurcated end of 117 and said other end of the lever 115.

A cam 121 on the shaft 83 has a follow groove 122 formed therein of a predetermined shape, and a follower roller 120, journaled on a stud shaft 129 carried by the lever 117 extends into and is actuated by the follow

groove 122. The other end of the lever 117 is journaled on a stud shaft 118 carried in a bearing member 119.

Secured on the bar 105 is a tubular body 123 with an interior passage 126 therein which carries a restrained plunger 125. The plunger is urged downwardly, as seen in Figure 2 by a spring 124. The plunger 125 has a flat face 128 facing forwardly and a curved face 127 toward the rear (toward the right in Figure 2). In this figure the clamping jaws 10 have moved to a position where the shaft 48 has (while moving forward to such position) acted against the curved surface 127 of the plunger 125 and has caused it to move upwardly and down again, with the result that the shaft has moved far enough to clear the face 128 of the plunger and to allow the latter to move downwardly.

Immediately afterward the bar 105 is moved in the direction of the arrow by the cam 121, the linkages and the sector and the rack, thus the portion 12 of the clamping unit is moved forwardly so that the boss 47 thereon is moved against the tension of the springs 44 and 45, due to the fact that the portion 11 of the clamping unit is secured to the chain and cannot move faster than the chain can move. As the above described action occurs, the book which was clamped in the unit 10 is released and passes out in the manner shown at 10D in Figure 1, wherein the book 130 passes down the upright guide 91 and then it passes down the incline of the conveyor 88 and out.

One example of the form of the cam groove 122 is that the roller moves outwardly from the point of least radius to the point where the clamping unit at the position 10D opens during a rotation of the cam of approximately 23°, then the clamping unit remains open (due to the shape of the follow cam groove) during approximately the next 60°. During the next 20° (approximately) the clamping unit begins to close, and then said unit closes upon a book, which is fed to it at that stage, during approximately the next 52°.

Referring now to Figure 3, a feeding stage for feeding books sequentially into empty clamping units, which have had the finished books ejected therefrom as described above, is shown. Below the then empty clamping unit is a platform 131 which carries a front guide and former 132. This former is secured on the platform by means of bolts 133. These guides and formers 132 are interchangeable for different thicknesses of books. The platform 131 has a stepped extension 134 which is secured to a sleeve member 135 reciprocally carried on a vertical guide shaft 136, supported on a base flange.

Pivotally connected to the member 135 is a link 138, one end of which is pivotally connected to a stud 137 in said member.

The link has its other end pivotally connected to a lever 141 by means of a stud 140 extending through aligned holes in elements 138 and 141. A lever 142 is pivoted on a shaft 143 and has a follow groove roller 144 engaged with a groove 155 in a follow cam 160. The lever 142 has an extension 154 which is pivotally connected to a bifurcated portion 146 of a link 147 by means of a shaft 145 in aligned holes in 146 and 154.

The lever 141 is pivoted on a stud 153 and has an extension 152 which carries a longitudinal slot carrying a block 149 with a lateral stud 156 engaging a bifurcated head 148 of the link 147. The block has a longitudinal threaded hole therein which is engaged by an axial screw 150 having an external head 151 which may be rotated in either direction to move the block 149 and thereby adjust the degree of movement of the elevator platform 131. By providing intermediate pivotal connections at 143—153, it is possible to flex the levers 142—154 and 141—152, so that the sleeve 135 may be moved on the vertical guide shaft 136 to elevate or lower the platform 131.

The clamp unit 11, 12 shown in Figure 3 is still held open after having discharged a finished book and is ready to receive another book 130*a* and take it through the drying oven. As the cam 160 rotates in the direction of the arrow, Figure 3, the mechanism just described raises the book to a position between the jaws 10 during a movement of about 25°, for example, of the cam. During the next 20°, approximately, the platform 131 holds the book up between the jaws 10—10; and during the next 45°, also approximately, the platform 131 moves down, leaving the book between the jaws ready to traverse the drying oven 200.

The shaft 83 also carries a cam 158 having a follow groove 157 formed therein. A bearing member 159, secured to a stationary member or frame, carries a stub shaft 161 which, in turn, extends through a bearing hole in one end of a lever 162. This lever has an extension 163. At the junction of the lever with the extension is a follow groove roller 164 which cooperates with the groove 157.

The extension 163 has a cross-hole therein that is aligned with holes in a bifurcated head 165 and a clevis pin 166 extends therethrough. The head 165 has a shaft portion 167, the end 168 may be threaded with a right hand thread which engages a corresponding internal thread in the lower end of a member 169. A nut 179 also has a right hand thread and functions as a lock nut to retain certain settings to be presently described.

A bifurcated head 172 has aligned cross holes therein to accommodate a clevis pin 177 which extends through such holes and through a corresponding hole in one end of a lever 175, which is fulcrumed on a stud 174 carried by a stationary support 173. The head 172 has a shaft portion 171, the end of which is threaded with a left hand thread which engages a cooperative threaded hole formed in the upper end of the member 169. A left hand lock nut 179*a* on the end 170 functions as a locknut to retain settings, as does locknut 179.

The right end of the lever 175 has a bearing hole therein to accommodate a stub shaft 176 which also cooperates with aligned holes formed in a bifurcated member 178. The member 178 has another bifurcated portion into which the flattened portion 180*a* of a shaft 180 fits, and to complete the linkage thereof a pin 181 forms a working fit in aligned holes in the member 178 and in the flattened portion 180*a*.

The shaft 180 is reciprocally carried in a block member 184 which has lateral guide slots 185 therein. Rectangular guide members 186 are secured to stationary frame members 187 and 187*a*, and they engage and cooperate with the guide slots 185. Screws 188 and 189 are in threaded holes in the frame members 187 and 187*a*, with their points oppositely engaging the block member 184, and by means of these screws, a "round and back" gauge 182 secured on the lower end of the shaft 180 by means of a set screw 183 and having a book engaging face 190, may be adjusted laterally. The adjustment of this shaft longitudinally is effected by means of the member 169 and retained by the locknuts 179 and 179*a*.

As the cam 158 rotates in the direction of the arrow through approximately 30° from the position shown in Figure 4, the shaft 180, through the lever 162, the shafts 167 and 171, the lever 175 and the bifurcated member 178; moves downwardly and the curved surface 190 of the "round back" is moved into engagement with the back of the book. This of course is after the clamp elements have engaged the sides of the book, and the curved surface 190 and the guide members 35 and 52 cooperate to form a neat and "clean cut" rounded back on the book. The clamp elements 11 and 12 at the same time are pressing the two covers inwardly of the book, and the combination of these elements with the guide members 35 and 52 and the curved surface 190 in holding the book elements in a predetermined relation while they traverse the drying oven, results in a quality product far

superior in appearance and durability to such books produced by hand work.

As pointed out above the element **182**, carrying the curved surface **190** was moved downwardly during approximately the first 30° of the cam **158**. During approximately the next 12° to 15°, the element **182** dwells in the down position, and during the succeeding 45° the element **182** is moved up and dwells in its up or normal position during approximately the next 225° of rotation of the shft **83** and the cam **158** thereon.

From the above description it is quite evident that the apparatus described, receives the books one at a time after they are ready for drying; automatically feeds the books, one at a time, into clamping elements from which a finished book has just been discharged; traverses the drying oven with the last mentioned book and releases it onto a conveyor which delivers the then dried book to a point outside the oven.

Referring now to Figure 7, we show a modification wherein the oven is substantially the same as that shown in Figure 1, except that it is provided with two discharge stations **10D** and **10E** each of which is actuated by cams and mechanism like that shown and described in connection with Figure 2. In each of these a cam **121** times the action and through the linkages, the sector **107** and the rack **106** effects the actuation of the jaw member **12** at discharge position released, passes down the upright guide **91***c* and passes onto an inclined conveyor **88***e* and out.

As the conveyor chain **68** moves up to the loading stations **106** and **10H**, the following occurs simultaneously, each loading station having mechanism like that shown and described in Figures 3 and 4 associated therewith: Books from one conveyor line are delivered singly upon the platform **131***g* at loading station **10G**. Other books from a second conveyor line are delivered singly upon the platform **131***h*, the platforms are raised and a book on the platform **131***h* is delivered to the loading station **10G** and at the same time a book on the platform **131** is delivered to the loading station **10H**. In both instances the shape of the book is taken care of by duplicate elements like those shown in Figure 4. By this arrangement, a drying oven arranged to take double the number of books can be loaded and discharged.

Figure 8 shows another modification for increasing the capacity of the drying oven. The shaft **53** is made longer in each case. The shaft carries sprockets **66** and **67**, just as the one does in Figure 6.

A third sprocket **66***a* is mounted on the shaft **53** in spaced apart relation to the sprocket **66** such relation being that the distance from the center line of the sprocket **66** to the center line of the sprocket **66***a* is equal to the center line of the sprocket **66** to the center line of the sprocket **67**. Thus we can mount clamping units **10X** between a chain **68***a* embracing the sprocket **66***a* and the chain **68** as well as book clamping units **10** between the chains **68** and **69**.

Now by making the oven correspondingly thicker and by arranging the feeding and discharge stations in side by side relation even though they be duplicates by those already described herein, a drying oven capable of drying twice the number of books is provided.

In the arrangement shown in Figure 9 we contemplate spacing the sprockets **66** and **67** far enough apart axially on the shaft **53** to accommodate a triple book clamping unit **10Y**.

Each clamping unit **10Y** is identical with the clamping units shown in Figure 5 with the exception that the bosses **38** and **39** and **15** and **16** adjacent to each end of the triple jaw and the spring loaded clamping and unclamping elements **47**, **50**, **49** and **48**, which may best been seen in Figure 5, centrally and in cooperative relation with a centrally located upstanding boss **23** having holes **25** and **25***a* to accommodate the shafts **42** and **43** which carry springs **44** and **45** respectively.

With such an arrangement, the feeding elements, such as those shown in Figures 2, 3 and 4, would be in triplicate laterally so that each could handle three books at one time.

Although we have herein shown and described by way of example one embodiment of the invention and some modifications thereof, it will be understood that we are not to be limited to the details and features specifically described herein as many changes may be made in the arrangements shown and described within the scope of the following claims.

Having now particularly described and ascertained the nature of the invention, and in what manner the same is to be performed, what is claimed is:

1. In apparatus for bookbinding in combination, a drying oven enclosure, means to heat said oven, a conveyor comprising a pair of spaced apart parallel endless chains each festooned over a series of sprockets, a plurality of book conveying clamps each commonly supported by both said chains, each clamp comprising a pair of cooperative flat jaws and each pair having spring means urging the jaws thereof together to exert pressure on a book therein, means to drive said conveyor and thereby cause said clamps to traverse a path through said oven, an unloading station for delivering finished books outside the oven, means at said unloading station for separating said jaws of a clamp for a predetermined time and releasing a finished book, an inlet station at the section of the machine adjacent to said unloading station and including means to elevate an unfinished book into the separated jaws of an adjacent clamp where said separating means releases said jaws to clamp said unfinished book.

2. Apparatus according to claim 1, in which said festoons are mainly disposed along horizontal lines, and in which each festoon of said chain is bordered by stationary lateral guide means, and other guide means adjacent to said first guide means and beneath said chains and having upper surfaces which support substantial portions of the weight of said chains and the weight of the book conveying clamps carried by said chains.

3. Apparatus according to claim 1, in which said unloading station includes cam means driven in time with the movement of said conveyor and including elements for separating said jaws against the urge of said spring means and thereby releasing a book, said last elements being adapted to hold said jaws separated for a predetermined time period.

4. Apparatus according to claim 1, in which said unloading station includes cam means driven in time with the movement of said conveyor and including in cooperation therewith a system of levers and a sector having peripheral teeth, a reciprocally mounted bar having teeth thereon meshing with said first teeth, and plunger means carried by said bar engaging one of the jaws of said clamp and moving it in a releasing direction and holding it open for a predetermined time period.

5. Apparatus according to claim 1, in which said unloading station includes cam controlled jaw releasing means adapted to open said jaws and to hold said jaws open for a predetermined time, and an inclined conveyor having a guide track with which a clamp at the unloading station registers, whereby the book released by said jaws traverses said guide track and is delivered on to said conveyor to be moved to a point of use.

6. In apparatus for bookbinding in combination, a drying oven enclosure, means to heat said oven, a conveyor comprising a pair of spaced apart parallel endless chains each festooned over a series of sprockets, a plurality of book conveying clamps each commonly supported by said chains, each clamp comprising a pair of cooperative jaws urged together to exert pressure upon a book positioned between said jaws, means to drive said conveyor, an unloading station for delivering finished books from said oven, an inlet station adjacent to said unloading station and having elevator means for feeding books thereto, and overlapping controls for first releasing a finished book at

said unloading station by holding the jaws of a clamp open at that position and holding it open until it has moved to said inlet station and releasing it after the open clamp then at the inlet position has received an unfinished book from said elevator means.

7. Apparatus according to claim 6 in which the jaws of each clamp carry opposed guide members which oppositely engage the book adjacent to a round and back gauge and conjointly they form a nicely rounded back, bordered by grooves formed by said guide members, and in which said elevator carries a front guide and former which forms the front of the book in time with the forming of the back.

8. Apparatus according to claim 6, in which each clamp is comprised of a pair of flat faced cooperative jaws carrying opposed guide members along the upper edges of said flat faces, one of said jaws carrying means slidably supporting the other, spring means urging said jaws together, lug means on the supporting jaw to mount it on the conveyor chains, and engageable means on the other jaw for opening the jaws against the urge of said spring means.

9. Apparatus according to claim 6, in which each clamp is comprised of a pair of flat faced cooperative jaws carrying opposed guide members along the upper edges thereof bordering said faces, aligned bosses on the upper portion of each jaw adjacent to each end thereof, aligned holes in said bosses, a shaft in each pair of aligned holes fixed in one boss and slidable in the other, lug means on each end of one of said jaws for attachment to said chains, spring means urging the other jaw toward said last jaw, and engageable means on said other jaw for moving it against the urge of said spring means.

10. The invention according to claim 9, in which said jaws each have a horizontal flange at the top thereof and each jaw and its top flange is reinforced by triangular webs, and in which the last mentioned jaw has an upstanding lug between said bosses and said other jaw has an offset lug closely adjacent to said upstanding lug, aligned holes formed in each lug, a rod extending into said holes and secured in said upstanding lug, spring means on said rod having one end bearing on said offset lug and on nut means on the free end of said rod, and an engageable stud on said other jaw for opening said jaws.

11. In apparatus of the character described, means to effect the opening of the spring loaded cooperative jaws of a book clamping member, wherein spring means urges said jaws together and one jaw carries an engageable stud, said means comprising a cam pivoted lever means swung through an arc thereby, a toothed sector moved through a corresponding arc, a bar reciprocally mounted and having rack teeth meshing with said sector, and one way latch means on said bar adapted to engage said one stud and move the jaw carrying said stud against the urge of its spring load.

12. In apparatus for bookbinding in combination with a drying oven, a conveyor traversing said oven, said conveyor carrying a plurality of book conveying clamps, each clamp comprising a pair of jaw members urged together by spring means, means to release said jaw members at an unloading station in said oven, said means to release being adapted to hold said jaws open as the latter reach an inlet station in said oven, elevator means to deliver an unfinished book between said jaws, and a round and back gauge centralized with said last mentioned book, and means to bring it into cooperative relation with said jaws for conjointly forming the back of said book.

13. The invention according to claim 6 in which said conveyor is comprised of three spaced apart parallel chains, each being festooned over its individual series of sprockets, and in which twice as many clamps are employed, one series of clamps being conjointly supported by the middle chain and one of the outside chains, and the other being supported by said middle chain and the other outside chain.

14. The invention according to claim 11 in which one set of said jaws is at an unloading station and an adjacent set of jaws is simultaneously positioned at an inlet station, and cam controlled means to open both said sets of jaws simultaneously, one set to discharge a finished book at said unloading station and the other set being adapted to receive an unfinished book at said inlet station, and thereafter said last set being adapted to move out from the influence of said cam controlled means as another set of said jaws moves into said unloading station.

15. The invention according to claim 14 wherein said spring loaded cooperative jaws are disposed in sets of laterally disposed groups, a plurality of co-extensive chains disposed on sprockets and supporting said groups, and in which plural unloading stations and adjacent inlet stations are operated by said cam controlled means, means to receive a plurality of finished books from said jaws at said unloading stations, and other means to elevate a plurality of unfinished books into said groups at said inlet station.

16. The invention according to claim 6, in which three parallel spaced apart chains are employed, in which the sprockets in each set are triplicate, in which the clamps commonly supported by the chains each have cooperative jaws formed to carry two books, and in which the unloading station and the inlet station are each adapted to receive and adapted to deliver, respectively, books in groups of two, thus doubling the capacity of said oven with a minimum increase in physical size.

17. The invention according to claim 6, in which three parallel spaced apart chains are employed, in which the sprockets in each set are triplicate, in which the clamps commonly supported by the chains each have cooperative jaws formed to carry a plurality of books in side by side relation, and in which the unloading station and the inlet station are each adapted to receive and adapted to deliver, respectively, books in plural groups thus doubling the capacity of said oven with a minimum increase in physical size.

18. The invention according to claim 6, in which three parallel spaced apart chains are employed, in which the sprockets in each set are triplicate, in which the clamps commonly supported by the chains each have cooperative jaws formed to carry three books in side by side relation and in which the unloading station and the inlet station are each adapted to receive and adapted to deliver, respectively, books in groups of three, thus doubling the capacity of said oven with a minimum increase in physical size.

19. In apparatus of the character described, means to effect the opening of the spring loaded cooperative jaws of a book clamping member, wherein spring means urges said jaws together and one jaw carries an engageable stud, said means comprising a cam pivoted lever means swung through an arc thereby, a toothed sector moved through a corresponding arc, a bar reciprocally mounted and having rack teeth meshing with said sector, and one way latch means on said bar adapted to engage said one stud and move the jaw carrying said stud against the urge of its spring load, one set of said jaws being at an unloading station and an adjacent set of jaws being simultaneously positioned at an inlet station, and cam controlled means to open both said sets of jaws simultaneously, one set to discharge a finished book at said unloading station and the other set receiving an unfinished book at said inlet station, and thereafter said last set being adapted to move out from the influence of said cam controlled means as another set of said jaws moves into said unloading station.

20. In apparatus of the character described, means to effect the opening of the spring loaded cooperative jaws of a book clamping member, wherein spring means urges said jaws together and one jaw carries an engageable stud, said means comprising a cam pivoted lever means swung through an arc thereby, a toothed sector moved through a corresponding arc, a bar reciprocally mounted

and having rack teeth meshing with said sector, and one way latch means on said bar adapted to engage said one stud and move the jaw carrying said stud against the urge of its spring load, one set of said jaws being at an unloading station and an adjacent set of jaws being simultaneously positioned at an inlet station, and cam controlled means to open both said sets of jaws simultaneously, one set to discharge a finished book at said unloading station and the other set receiving an unfinished book at said inlet station, and thereafter said last set being adapted to move out from the influence of said cam controlled means as another set of said jaws moves into said unloading station, said spring loaded cooperative jaws being disposed in sets of laterally disposed groups, a plurality of co-extensive chains disposed on sprockets and supporting said groups, and plural unloading stations and adjacent inlet stations being operated by said cam controlled means, means to receive a plurality of finished books from said jaws at said unloading stations, and other means to elevate a plurality of unfinished books into said groups at said inlet station.

21. Apparatus according to claim 1 in which said conveyor sprockets are located at the corners of a rectangle, an intermediate pair of sprockets within said rectangle near one end thereof, whereby said chains travel horizontally, then vertically, then horizontally in the opposite direction, then internally in the first horizontal direction, and finally in the opposite horizontal direction.

22. Apparatus according to claim 1 in which said conveyor sprockets are located at the corners of a rectangle, and heating means along three sides of said rectangle.

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