Nov. 16, 1943. I. SPINNER 2,334,589

BINDING MACHINE

Filed Nov. 13, 1939 4 Sheets-Sheet 1

Fig. 1

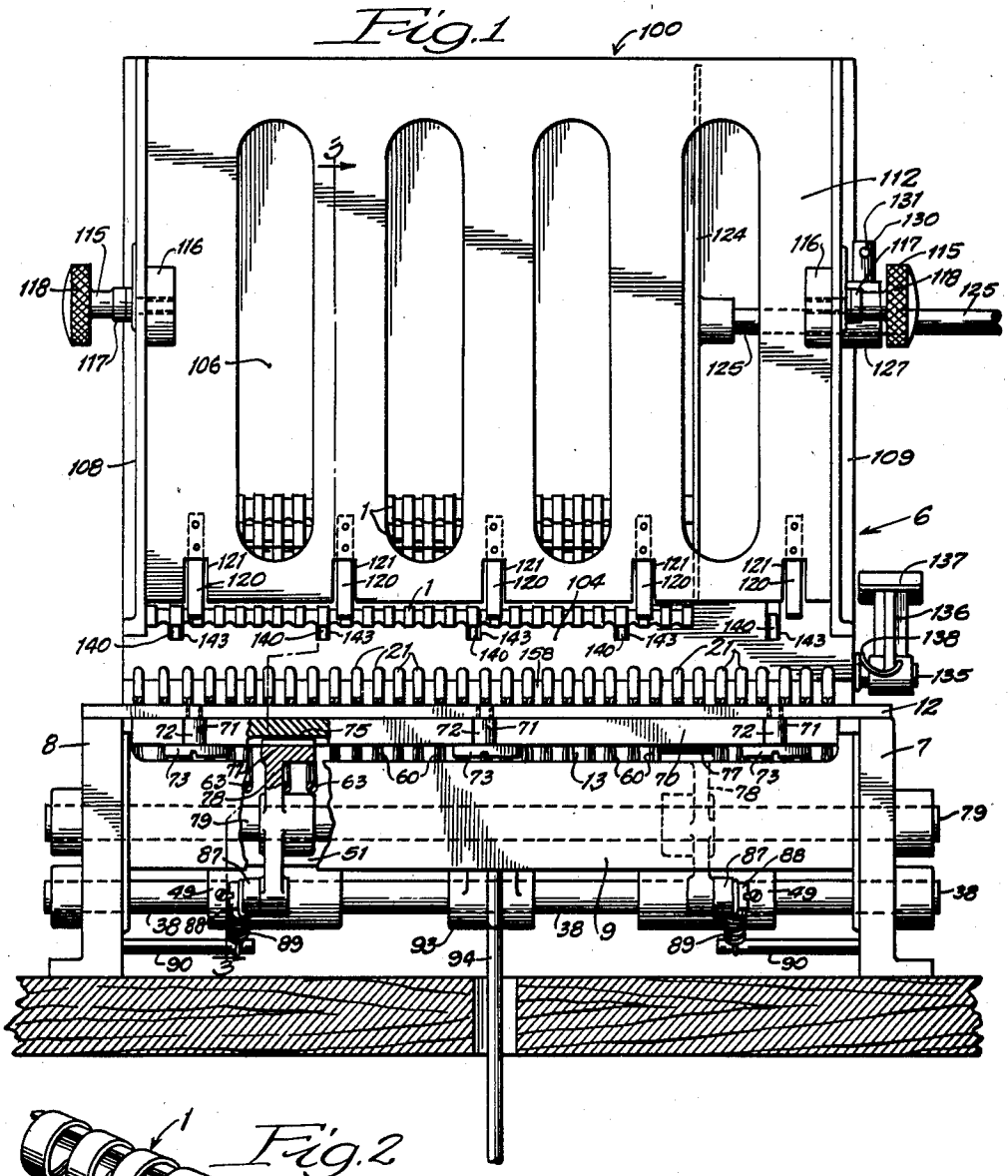
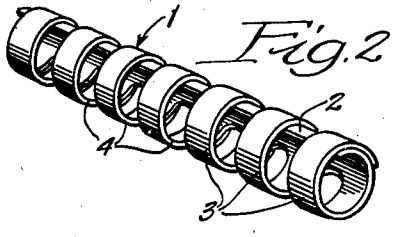


Fig. 2



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BINDING MACHINE

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Fig. 3

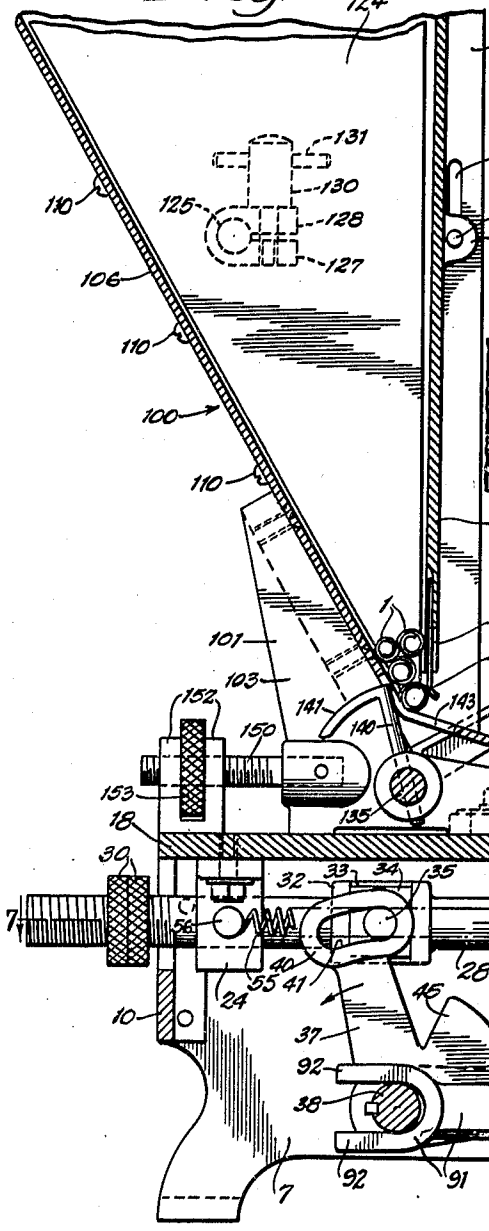
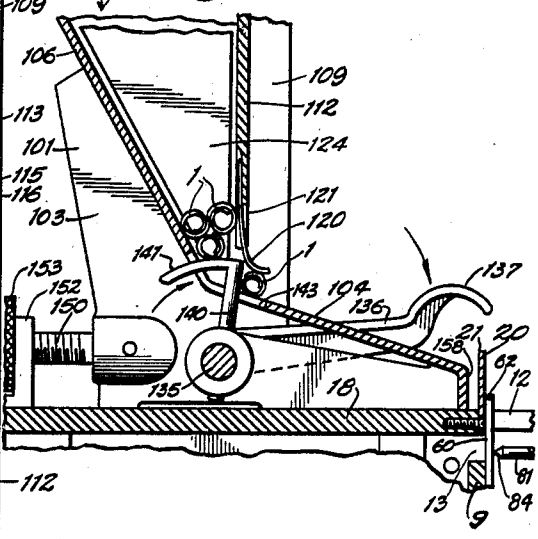


Fig. 4



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Nov. 16, 1943. I. SPINNER 2,334,589

BINDING MACHINE

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Fig. 5

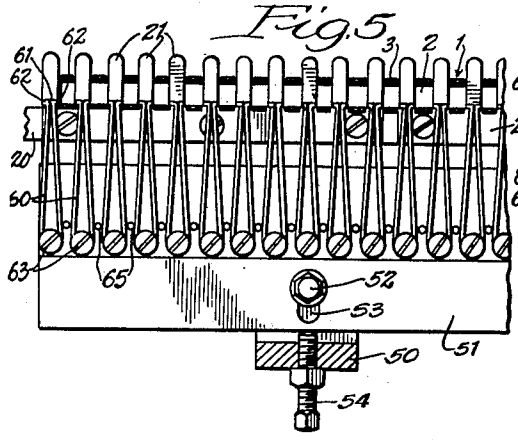


Fig. 6

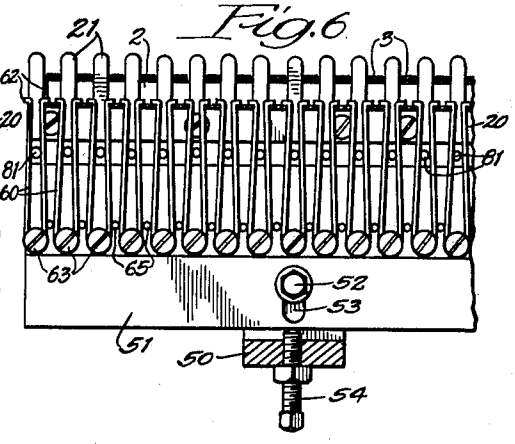
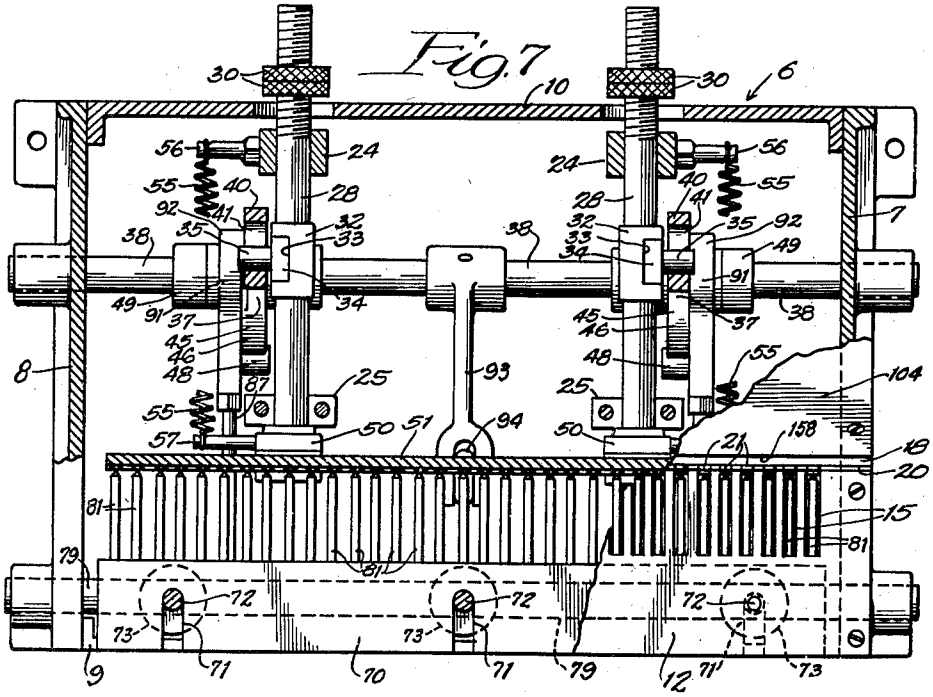


Fig. 7



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BINDING MACHINE

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Fig. 8

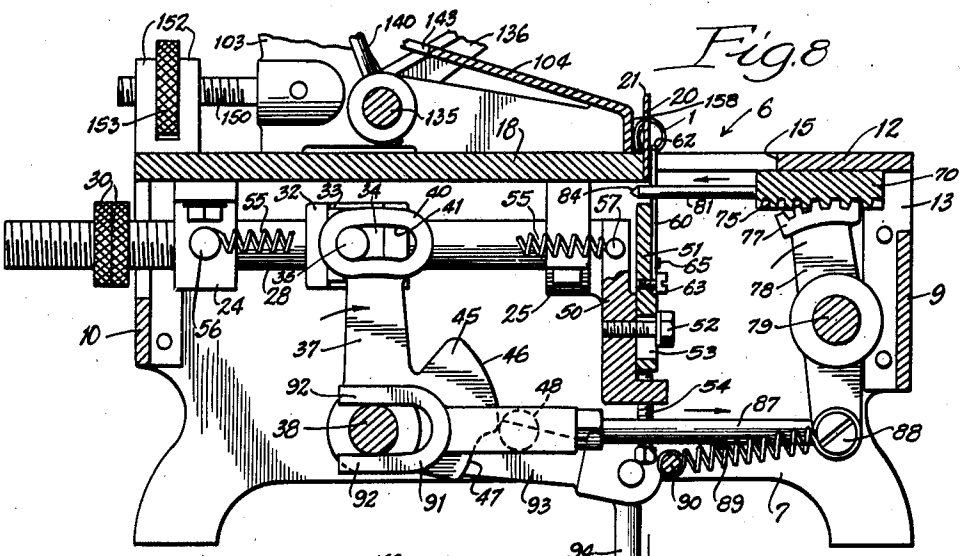
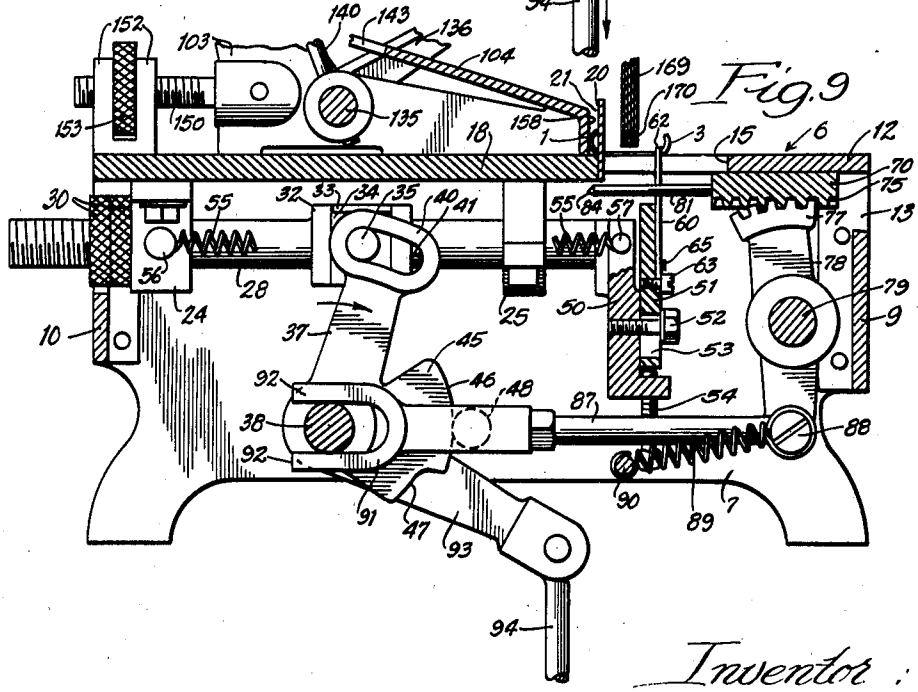


Fig. 9



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Patented Nov. 16, 1943

2,334,589

UNITED STATES PATENT OFFICE

2,334,589

BINDING MACHINE

Isidore Spinner, Chicago, Ill.

Application November 13, 1939, Serial No. 303,998

14 Claims. (Cl. 11—1)

This invention relates to machines for binding books or stacks of sheets of paper by means of a resilient tubular binder of the type such as shown, for instance, in the United States patent to Douvry, No. 1,970,285, issued August 14, 1934.

The binder of the Douvry patent, which is only one of the types of binders which can be used in connection with the present invention, comprises a back having a number of fingers extending therefrom and curled to a tubular form. The material has sufficient elasticity to permit the fingers to spread open sufficiently to receive a stack of pages, without exceeding the elastic limit of the material so that upon release the fingers will resume the curled form under their own resiliency.

The machine of the present invention is provided with means for holding the back as the curled fingers are being uncurled to receive a stack of pages and for permitting the recurling of the fingers under their own resiliency until they pass through aligned perforations in a stack of pages to be bound.

It is one of the objects of the present invention to provide a machine of the above mentioned character which is capable of high speed operation and which can be used with binders of different diameters with a minimum of adjustment of the machine.

It is a still further object of the present invention to provide novel and improved mechanism for spreading or uncurling the fingers of the curled comb. In accordance with the prior practice, of uncurling binders of the type here involved, as exemplified, for instance, in the patent to Nelson, et al., No. 2,108,136, issued February 18, 1938, it was necessary first to position a curled comb or tubular binder in the machine and then move a rod lengthwise into the binder, which rod is then moved at right angles to the axis of the binder to uncurl the same. Thereafter, when the book has been bound, the rod must be retracted from the binder before the binder can be withdrawn from the machine. It is one of the objects of the present invention to provide a machine of the above character which can first grip the rings of the binder to uncurl the same and then, by a continuous operation, uncurl the fingers, thereby eliminating the operations of inserting a rod through the binder and then ultimately withdrawing the rod.

In accordance with the principles of the present invention the machine is provided with an operating shaft and a number of mechanisms successively driven by a continuous operation of the shaft, one of the mechanisms being driven from the shaft by a cam and the other mechanism being driven by a lost motion connection.

It is a still further object of the present invention to provide improved means for guiding the teeth or fingers of the binder against side movement as they recurl following an uncurling operation. By this arrangement the ends of the recurling fingers are always properly spaced so that if the perforated stack of pages is properly positioned with respect to two of the fingers then all of the fingers are in proper positions to enter the perforations.

The attainment of the above and further objects of the present invention will be apparent from the following specification taken in conjunction with the accompanying drawings forming a part thereof.

In the drawings:

Figure 1 is a front view of a machine embodying the present invention;

Figure 2 is a perspective view of one binder that can be used on the machine of Figure 1;

Figure 3 is a sectional view taken along the line 3—3 of Figure 1 and looking in the direction of the arrows;

Figure 4 is an end view of the comb feed mechanism of Figure 3, showing the mechanism in an alternate position;

Figure 5 is a fragmentary sectional view taken along the line 5—5 of Figure 3 and showing the spreader hooks in one position;

Figure 6 is a view similar to Figure 5 showing the spreader hooks in an alternate position;

Figure 7 is a sectional view taken along the line 7—7 of Figure 3;

Figure 8 is a fragmentary sectional view extending to Figure 1 and showing the mechanism in the position occupied after the spreader wires have been spread to grip the comb and before the uncurling operation; and

Figure 9 is a view corresponding to Figure 8 and showing the mechanism in its next succeeding position.

Reference may first be had to Figure 2, which illustrates a typical binder to be used with the present machine. The binder 1 consists of a back portion 2 and a plurality of parallel fingers or rings 3 integral therewith, and uniformly spaced from one another as indicated at 4. The binder is made of suitable material which can be curled into a longitudinal tubular form, as shown, and which has sufficient flexibility to permit

spreading it open, and sufficient elasticity to cause it to recurl under its own resiliency when released. It has been found that a certain type of cellulosic material, such as pyroxylin, by way of example, can be curled into this shape, and may be uncurled a substantial amount without exceeding the elastic limits of the material. The United States patent to Douvry, No. 1,970,285, issued August 14, 1934, shows and further describes a binder suitable for use in this machine.

Reference may now be had more particularly to figures of the drawing illustrating the binding machine. The binding machine 6 has a right hand end frame 7 and a left hand end frame 8 of similar shapes and secured together by a front rail 9 and a rear rail 10, the rails being secured to the end frames by suitable machine screws or bolts. A front top plate 12 is bolted to the top of the end frames 7 and 8 and extends the full length of the machine. This plate is appreciably above the front rail 9, there being a space 13 between the top of the front rail 9 and the bottom of the front top plate 12. The front top plate has a number of parallel slots 15 formed at the rear thereof and uniformly spaced apart, the spacings between the slots being substantially equal to the spacings 4 between adjacent rings 3 of the binder 1. A rear top plate 18 is also bolted or otherwise secured to the end frames and extends forward from the rear of the machine to a position almost but not quite at the rear edge of the top front plate 12, so that there is a longitudinally extending slot between the front and rear top plates. This slot is filled by a thin tempered tool steel spring spreader finger plate 20 that is screwed to the forward edge of the rear top plate 18. The spreader finger plate 20 has a number of spaced apart aligned spreader fingers 21 integral therewith and each of which extends vertically upward from the rear top plate 18. The distance between the centers of the spreader fingers 21 is equal to the distance between centers of adjacent spaces between fingers 3 of the binder 1. The width of the spreader fingers 21 is slightly less than the width of the spaces 4 between the fingers 3 of the binder 1, as may be seen from Figure 5. As may be seen from Figure 7, the fingers 21 are opposite the slots 15.

A pair of rear bearing boxes 24 and a pair of front bearing boxes 25 are bolted to the underside of the rear top plate 18 and project downwardly therefrom. A pair of operating rams 28—28 are mounted for longitudinal movement in the bearing boxes, each ram being supported in a front and a rear bearing box, as is apparent from Figures 3 and 7. The rear of each operating ram is threaded and extends rearwardly of the rear rail 10, which rear rail is provided with oversized openings through which the operating rams extend. The rams are adapted for longitudinal movement in the bearing boxes, and are provided with adjustable lock nuts 30 which abut against the rear bearing boxes 24 to limit the extent of forward movement of the operating rams, as illustrated in Figure 9.

Each operating ram includes an enlarged intermediate portion 32 having a milled channel-shaped slot 33 therein in which a square head 34 of the spreader operating block fits closely and slides freely. The spreader operating block has a cylindrical projection or pin 35 extending forwardly thereof for engagement by an operating yoke 37. There are two operating yokes 37 both of which are keyed to a rotary operating shaft 38 that is journalled in the end frames 7 and 8. Each operating yoke 37 has an enlarged head 40 at the top thereof, which head has an arcuate slot 41 formed therein, the arc being curved about the axis of the shaft 38 as a center. The pin 35 extends into and rides freely in the slot 41. The enlarged head 40 prevents the spreader operating block from dropping out of the channel slot 33. A spreader operating cam 45 is integral with the operating yoke 37 and includes a cam surface 46 curved along an arc of a circle having its center coincident with the axis of the shaft 38, and includes also a cam surface 47 extending radially inwardly from the surface 46.

At its forward end each operating ram 28 has a downwardly projecting support 50 integral therewith for supporting a spreader hook bar 51. The spreader hook bar 51 is adjustably locked to the supports 50 of the two operating rams 28 in any desired manner, as by machine bolts 52. To facilitate vertical adjustment, the spreader hook bar is provided with elongated holes 53 for receiving the bolts 52, which holes are of a width only very slightly in excess of the diameter of the shanks of the bolts 52. An adjusting lock screw 54 threads through the bottom of each spreader hook support 50 and bears against the spreader hook bar 51 for accurately positioning the same. By this arrangement the spreader hook bar may be adjusted vertically with great accuracy, but is capable of only one position lengthwise of the machine.

The operating rams, together with the spreader hook bar secured thereto, are biased to their rearmost position, which is the position illustrated in Figure 3, by a pair of springs 55. Each spring 55 is secured at the rear to a projection or pin 56 extending from the rear bearing boxes 24, which are stationary, and at its front to a pin 57 secured to the support 50 of the operating ram.

The spreader hook bar 51 has a number of spreader hooks 60 secured thereto. Each spreader hook comprises a spring wire bent to a U-shape with the ends of the wire then further brought together into contact, as indicated at 61 (Fig. 5). The top ends of each wire are bent outwardly, as indicated at 62. Each wire is secured to the spreader hook bar 51 by a screw 63, the head of which bears against the bight portion of the spreader hook, and the shank of which threads into the spreader hook support. The sides of the spreader hooks 60 are maintained in position converging towards one another by short spreader hook supporting pins 65 that are pressed into holes in the spreader hook bar and project slightly therefrom. Each spreader hook 60 extends through a slot 15 to a position above the top plate 12. The distance between the outermost edges of the outwardly bent parts 62 of each wire is only very slightly less than the width 4 of the slots between adjacent fingers of the binder 1, so that when the spreader hooks 60 are in their normal position the binder 1 may be positioned over the spreader hooks with the ends 62 of the spreader wires extending into the spaces 4 between adjacent rings 3 of the binder. The ends of the respective spreader hooks are in alignment with the spreader fingers 21, as may be seen in Figure 5. The spacings between adjacent spreader hooks is equal to the spacing of the slots 15 in the top plate 12, and equal to the spacing of the slots 4 between the rings 3 of the binder.

Means for spreading the spreader hooks 60 is provided. Said means comprises a needle bar 70 slidably mounted on the underside of the top plate 12. This bar 70 has slots 71 formed therein which extend rearward from the forward end thereof. Machine screws 72 having very much enlarged heads 73 thread into the bottom of the front top plate 12. The bar 70 rests on the screw heads 73 with the shanks of the screws 72 extending freely through the slot 71 of the bar 70. Two spaced gear racks 75 are formed on the underside of the bar 70 and mesh with needle operating rack segments 77 at the ends of levers 78 mounted for oscillating movement on a shaft 79 journalled in the end frames 7—8 near the front thereof.

Tempered steel spreader pins or needles 81 are secured to the needle bar 70 and project rearwardly thereof. These pins are press fitted into holes in the needle bar, and are in alignment with one another and spaced apart so that the pins 81 are opposite the centers of the respective spreader hooks 60. The rear or spreading end of each pin 81 is rounded off or tapered to a point as indicated at 84. Each of these pins is adapted to enter between the arms of a spreader hook 60 for spreading the arms apart from the position illustrated in Figure 5 to the position illustrated in Figure 6.

Each lever 78 extends below the shaft 79 and has an operating rod 87 secured thereto by a pivot pin 88 which also receives a spring 89, the opposite end of which is pinned as at 90 to a stationary part of the machine in order to bias the lever 78 to the position illustrated in Figure 3. The rear of the rod 87 is screwed to a yoke 91 adjacent the cam 45. A pair of tines 92—92 of the yoke 91 ride freely on the shaft 38 to support the rear of the rod and yoke combination 87—91. The cam parts 46 and 47 of the operating yoke 37 are adapted to bear against a roller 48 carried by the yoke 91 for operating the yoke, in a manner which will be apparent as this description proceeds. A collar 49 screwed to the shaft 38 adjacent each yoke 91 holds the yoke 91 against sliding lengthwise along the shaft 38.

The operating shaft 38 may be rotated in any desired manner, as by an operating arm 93 keyed to the shaft 38 and pivotally connected to an operating link 94 which may be reciprocated in any desired manner, as by a foot treadle.

A hopper is provided at the top of the machine for holding the curled combs, and a feed mechanism is provided for feeding the combs from the hopper one by one and automatically placing the fed comb in proper position for uncurling. The hopper is indicated in general by the reference numeral 100. The hopper comprises a supporting base 101 which is adjustably secured upon the rear top plate 18, and includes right hand and left hand end members 103, and an inclined front plate 104. A back plate 106 is secured to the two end members 103, and extends across the rear of the hopper in a generally upwardly and inclined direction, as illustrated in Figure 3. Triangular end plates 108—109 are secured to the back plate 106 in any desired manner, as by machine screws 110. A slotted front closure plate 112 is adjustably secured to and extends between the triangular end plates 108—109. For this purpose each of the end plates is provided with an oversized slot 113 at the front edge, through which slot locking screws 115 extend. The inner end of each locking screw is threaded into a boss 116 on the front closure plate 112. Each locking screw 115 has a head 117 that bears against the corresponding plate 108 or 109, and a knurled head 118 for turning the screw. The screws 115 are screwed into the bosses 116 and thus lock the plate 112 in its adjusted position. The plate may be adjusted both vertically and angularly. The front closure plate 112 has a number of leaf springs 120 secured thereto and extending beyond the bottom thereof. The front of the plate 112 has a number of rectangular slots 121 therein opposite the respective springs 120, to permit the springs 120 a greater freedom of flexibility. The position of the plate 112 is adjusted until the springs 120 are above the inclined front plate 104 an amount sufficient to hold the combs against freely rolling out of the hopper and yet sufficiently far from the inclined front plate 104 so that by the application of a small pressure against a comb the springs 120 are flexed out of the way to permit the escape of the comb.

A triangular aligning plate 124 is positioned within the hopper. This aligned plate is mounted on a shaft 125 that can be slid from left to right within the hopper to position the plate 124 at a desired distance from the inner surface of the end plate 108, that distance being made equal to the length of the combs being used at the time. The shaft 125 extends through the end plate 109, and is locked in place by a split clamp 127, the lower arm of which is welded or otherwise secured to the outside of the end plate 109, and the upper arm 128 of which may be clamped towards the lower arm to lock the shaft 125. For this purpose a screw 130 threads into the lower arm of the clamp and bears against the arm 128, the screw being adapted to be turned by a pin 131. The plate 124 prevents shifting of the combs within the hopper and assures the positioning of all combs with their ends bearing against the inner surface of the plate 108.

Binder feeding means, in the form of an escapement mechanism, is provided for advancing the combs 1 from the hopper, one by one. This escapement mechanism includes a shaft 135 journalled in the end members 103 of the supporting base 101, and provided with a trip handle 136 keyed to one end thereof outside of the hopper and having a finger portion 137 for actuating the same to turn the shaft 135. A coil spring 138 is provided for returning the escapement mechanism from its operated position illustrated in Figure 4, to its normal position illustrated in Figure 3. A number of discharge levers 140 are secured to the operating shaft 135. Each of these levers includes a radially extending portion which is press fitted through a radial hole in the shaft 135, and includes an arcuate portion 141. The levers 140 are spaced along the shaft 135, there being five such levers on the machine here illustrated, as may be seen from Figure 1. Opposite each lever the inclined front plate 104 has a slot 143 through which the lever 140 can move. Each slot is of a width only sufficient to permit free movement of a discharge lever 140. The levers 140 are positioned in the machine so that the top curved surface 141 terminates substantially at the level of the top of the lowermost comb 1, within the hopper. When the lever 136 is actuated to rotate the shaft 135 in a clockwise direction the aligned levers 140 force the lowermost comb in the hopper against the bottom of the spring 120 and force the spring forward to discharge the lowermost comb. At the same time the curved portions 141 of the

levers 140 support the remaining combs and prevent their escape from the hopper.

The hopper is mounted on the rear top plate 18 by machine screws 148, the heads of which rest on a flange on the end members 104, and the shanks of which extend through oversized slots 149 in the flanges of the end members. The hopper is thus adjustable forwardly and rearwardly on the base 18. Two threaded adjusting screws 150 extend rearwardly from the supporting base 101 at opposite ends thereof. Each screw 150 extends through oversized holes in a pair of lugs 152 that are secured to the rear top plate 18. A knurled nut 153 threaded on each screw 150 rides between the lugs 152, so that by adjustment of the knurled nuts 153 the hopper may be advanced or retracted on the plate 18 to position the vertical front edge 158 of the hopper at exactly the requisite distance from the fingers of the spreader finger plate 20. This distance is adjusted so that the back 2 of the binder fits snugly between the spreader finger plate 20 and the vertical front edge 158 of the hopper, while the curled fingers of the binder extend through the spaces between adjacent fingers 21. This distance differs for binders of different diameter.

An explanation will now be given of the mode of operation of the machine described. Precurled plastic binders all of the same length are placed in the hopper 100, and the aligning plate 124 is adjusted to the left, as seen in Figure 1, to such a position that the binders fit within the hopper with the ends of all of the binders bearing against the end plate 108. The front closure plate 112 is adjusted vertically so that the springs 128 just prevent the passage of the lowermost binder from the hopper. The position of the entire hopper on the plate 18 is then adjusted forwardly or rearwardly of the spreader finger plate 20 until the vertical front edge 158 of the front inclined hopper plate 104 is at exactly the requisite distance from the spreader finger plate 20. This adjustment is effected by turning the nuts 153. Thereafter the position of the hopper is fixed by locking the bolts 148. The machine is now ready for operation.

The operator first feeds a binder into position by moving the trip handle 136 downwardly, whereby the discharge levers 140 force the lowermost binder 1 out of the hopper. At this time the curved portions 141 of the discharge levers prevent the succeeding binders from falling out of the hopper. The binder thus released rolls down the inclined front plate 104 until the binder strikes the spreader finger plate 20. At this time the spaces 4 between adjacent rings of the binder are opposite the respective spreader fingers 21 so that the rings of the binder pass into the spaces between adjacent spreader fingers 21. The back 2 of the binder thus reaches a position opposite the space between the vertical front edge 158 of the feed mechanism and the spreader finger plate 20, and then falls into the position illustrated in Figure 3. At this time the bent parts 62 of each spreader hook 60 are in the position illustrated in Figure 5, so that the binder rolls over the top of the spreader hooks and ultimately assumes the position illustrated in Figure 3 wherein the ends 61 of the spreader hooks are in the spaces between adjacent rings of the binder.

The machine is now ready for operation to spread the binder. To effect this operation the operator pulls downwardly upon the link 94, in any desired manner, as by a foot treadle, thus causing the operating arm 93 to rotate the operating shaft 38 in a clockwise direction, as seen in Figure 3. During the initial rotation of the operating shaft 38, resulting in turning of the operating yoke 37, the arcuate slot 41 of each yoke rides around the pin 35, so that no motion of the operating rams 28 is produced. During this initial clockwise turning of the operating yokes the cam surface 47 of the operating yoke bears against the cooperating cam surface or roller 48 on the yoke 91 and forces the yoke 91 to the right as seen in Figure 3. This produces a counter-clockwise rotation of the levers 78 about the shaft 79. The gear segments 77 of the levers 78 operate on the gear racks 75 of the needle bar 70 and move the needle bar to the left from the position illustrated in Figure 3 to that illustrated in Figure 8. During this leftward movement of the needle bar 70 the needle bar is still supported by the enlarged heads 73 of the machine screws 72. Rearward movement of the needle bar 70 causes the rear ends of the needles 81 to enter the spaces between adjacent prongs or tines of each spreader hook 60 and spread the free ends of the spreader hooks from the positions illustrated in Figure 5 to the positions illustrated in Figure 6. The ends 62 of each spreader hook thus enter the adjacent rings 3 of the binder so that each ring 3 of the binder receives the outwardly bent part 62 of the two adjacent spreader hooks. After the rod 87 has been moved a short distance to the right to spread the spreader hooks 60 as above set forth, the arcuate cam surface 46 engages the roller 43 of the yoke 91 so that upon further rotation of the operating shaft 38, and with it the operating yoke 37 the cam 45, the cam surface 46 retains the rod 87 in the position to which it has been moved against the action of the return springs 89. At this time the left hand end of the arcuate slot 41 engages the pin 35, as seen in Figure 8, so that upon continued rotation of the operating shaft 38 the operating yokes 37 acting upon the pins 35 force the operating rams 28 rightward against the action of the return springs 55. This forces the support 50 and the spreader hook bar 51, carrying the spreader hooks 60, to the right. The spreader hooks ride upon the spreader pins 81 so that the spreader hooks are maintained spread. The bent back portions 62 of the spreader hooks thus pull the rings of the binder to the right. At this time the back 2 of the binder is held by the spreader fingers 21 of the spreader finger plate 20 against forward movement. The respective rings of the binder are thus uncurled.

The operator may then position a stack of pages 169 having aligned perforations immediately in front of the spreader finger plate 20, with the aligned perforations 170 in a position to receive the free ends of the fingers of the binder, as illustrated in Figure 9. The foot treadle is then gradually released, thereby permitting the springs 55 to return the operating rams 28 to the position illustrated in Figure 3. This causes the spreader hook bar 51 to return to the position illustrated in Figure 3, and thereafter causes the needle bar 70 also to return to the position illustrated in Figure 3, whereby the spreader hooks are first returned to their rearmost position and then the needles 81 are withdrawn from between the prongs or tines of the spreader hooks 60 to permit the spreader hooks to return to their normal position, as illustrated in Figure 5. The book with the pages bound therein by the binder may then

be removed from the machine by merely lifting upwardly on the same.

The lock nuts **30** are set for each size of binder so that the forward motion of the operating rams, and with it the spreader hooks, is limited to such an extent that the fingers or rings of the binder will be spread sufficiently to permit insertion of the pack of sheets but without allowing the ends of the rings of the binder to escape from under the spreader hooks.

In using rings of comparatively large diameter the requisite movement of the ram to produce the necessary uncurling of the fingers must be comparatively great. At such times it is necessary to guide the free ends of the uncurling rings of the binder against side movement, because if any side movement takes place then the free ends of the fingers may not be in proper position, upon recurling of the binder, to enter the aligned holes in the stack of pages to be bound. It is to be noted that the spreader hooks **60** perform the function of maintaining the uncurled teeth of the binder against side movement, and that during the recurling operation the rings of the binder are maintained in proper alignment with respect to one another, and therefore with respect to the perforations **170** in the stack of pages to be bound. The spreader hooks **60** are themselves maintained against any possible side movement during the uncurling or recurling operation by the slots **15** in the top plate **12**, since the spreader hooks ride in these slots during the forward and backward movement of the spreader hook bar **51**. The needles or pins **81** which spread the spreader hooks also maintain the spreader hooks properly spaced and in proper alignment during the to and fro movement of the spreader hook bar. Thus the spreader hooks **60** prevent side movement of the ends of the binder while the same is recurling.

An assembled book may be disassembled in a manner similar to the assembling operation. When this is to be done the book is first positioned over the spreader finger plate **20** with the spreader fingers **21** extending in the spaces **4** between adjacent rings of the binder and with the fingers extending between the binder back **2** and one of the covers or end sheets of the book or stack of pages. The back **2** of the binder thus lies between the spreader finger plate **20** and the vertical front edge **158** of the hopper assembly. Thereafter, upon rotation of the operating shaft **38**, the spreader hooks are first spread to grip the rings and then the spreader hook bar is moved forward to uncurl the rings and permit removal of the stack of pages from the binder while the spreader hooks **60** retain the binder in the machine.

In compliance with the requirements of the patent statutes I have here shown and described a preferred embodiment of my invention. It is, however, to be understood that the invention is not limited to the precise construction here shown, the same being merely illustrative of the principles of the invention. What I consider new and desire to secure by Letters Patent is:

1. Apparatus for simultaneously uncurling a plurality of aligned spaced resilient rings for binding a stack of perforated sheets, said apparatus including means for holding one end of each ring during the uncurling operation, a plurality of spreader hooks, and means for first moving the spreader hooks into the respective rings and then moving the spreader hooks in a direction away from the held ends of the rings to uncurl the rings.

2. Apparatus for simultaneously uncurling a plurality of aligned spaced resilient rings for binding a stack of perforated sheets, said apparatus including means for holding one end of each ring during the uncurling operation, a plurality of spreader hooks, and means for first moving the spreader hooks into the respective rings and then moving the spreader hooks in a direction away from the held ends of the rings to uncurl the rings, said last means including an operating mechanism operable by a continuous movement in one direction to effect both motions of the spreader hooks successively.

3. Apparatus for simultaneously uncurling a plurality of aligned spaced resilient rings for binding a stack of perforated sheets, said apparatus including means for holding one end of each ring during the uncurling operation, a plurality of spreader hooks, means for moving the hooks into the respective rings, means for then moving the hooks in a direction away from the held ends of the rings, while the hooks are within the rings, an operating shaft, and driving connections between the shaft and both of said last named means, said driving connections including a lost motion mechanism for maintaining one of said last named means stationary during operation of the other of said last named means.

4. Apparatus for binding a pack of sheets with a resilient binder having a continuous back portion with curled fingers adapted for engagement with aligned perforations in said pack of sheets, said apparatus including means for holding the back of the binder, a slidably mounted bar, cam means for sliding said bar during the initial operation of the machine and holding said bar stationary upon continued operation of the machine, operating means for said cam means, means for uncurling the fingers, means controlled by the sliding bar for moving the uncurling means into operative position with respect to the binder, and means including a lost motion connection between the operating means and the finger uncurling means.

5. Apparatus for uncurling and inserting a plurality of resilient binder rings through aligned perforations in a stack of pages for binding the pages, said apparatus comprising a plurality of spaced aligned fingers for receiving one ring in each space between successive fingers and holding one end of each ring against forward movement while the opposite end is free for forward movement, means having movement in one direction for positioning to uncurl the rings and in another direction for uncurling the rings, said means including a plurality of hook members, and operating mechanism for imparting the two motions to said hook members successively.

6. Apparatus for uncurling and inserting a plurality of resilient binder rings through aligned perforations in a stack of pages for binding the pages, said apparatus comprising a plurality of spaced aligned fingers for receiving one ring in each space between successive fingers and holding one end of each ring against forward movement while the opposite end is free for forward movement, means having movement in one direction for positioning to uncurl the rings and in another direction for uncurling the rings, and operating mechanism for imparting the two motions to said means successively, said operating mechanism including an operating lever having cam means for imparting one of said motions and a lost motion connection between said lever and

said operating mechanism for imparting the succeeding motion.

7. Mechanism for spreading a binder of the type having a plurality of spaced parallel fingers held together by a back portion from which the fingers extend, said mechanism including means for holding the binder, a front plate extending up to the binder and having parallel slots therethrough at right angles to the said binder holding means and successive slots being opposite successive spaces between curled fingers, binder spreading means extending through the slots, and means for moving the spreading means first in a direction at right angles to the length of the slots and then lengthwise of the slots and away from the binder holding means for spreading the binder.

8. Apparatus for simultaneously uncurling a plurality of aligned spaced resilient rings for binding a stack of perforated sheets, said apparatus including spreader members adapted to enter between adjacent rings, each member having a hook at its end, means for moving the hook of each member into an adjacent ring, means for moving the members in a direction at right angles to the axis of alignment of the rings, and means for holding at least one part of each ring against following the spreader members upon said last mentioned movement of the spreader members, to uncurl the rings.

9. Apparatus for simultaneously uncurling a plurality of aligned spaced resilient rings for binding a stack of perforated sheets, said apparatus including a spreader hook bar, a plurality of spreader hooks carried by said bar and adapted to enter between adjacent rings, a needle bar having pins cooperating with the respective hooks, means for moving the needle bar into engagement with the spreader hooks to move the hooks into the rings, means for moving the hooks in a direction at right angles to the axis of alignment of the rings, and means for holding at least one part of each ring against following the spreader hooks upon said last mentioned movement of the spreader hooks, to uncurl the rings.

10. In a machine of the class described, means for holding a binding near its back, means insertable between the rings of said binding and movable into said rings, and means for successively causing second means to move into said rings and causing said first and second means to move apart.

11. In a machine of the class described, means for holding a binding near its back, means insertable between the rings of said binding and movable into said rings, and means responsive to a single movement of the operator of said machine for successively causing said second means to move into said rings and causing said first and second means to move apart.

12. In a machine of the class described, means for holding a binding near its back, hooks for entering into the rings of said binding and engaging the inner sides thereof, a single control member, and means responsive to the operation of said control member for causing said hooks to enter said rings and engage said inner sides and for thereafter causing said first means and said hooks to move apart.

13. In a machine of the class described, means for holding a binding near its back, fingers adapted to project between the rings of said binding and having ends formed to project into said rings, there being a pair of said fingers for each of said rings between which said ring is adapted to lie and the fingers of each pair having their ends projecting towards each other and initially spaced enough to allow said ring to fall between them, and means for successively causing the fingers of each pair to move towards each other and for moving said fingers away from said holding means.

14. In a machine of the class described, means for holding a binding near its back, means for engaging the rings of said binding, an operating member, mechanism actuated by said operating member for causing said second means to engage said rings, and mechanism actuated by said operating member and including a lost motion connection for moving said first and second means apart.

ISIDORE SPINNER.