

Nov. 16, 1943.

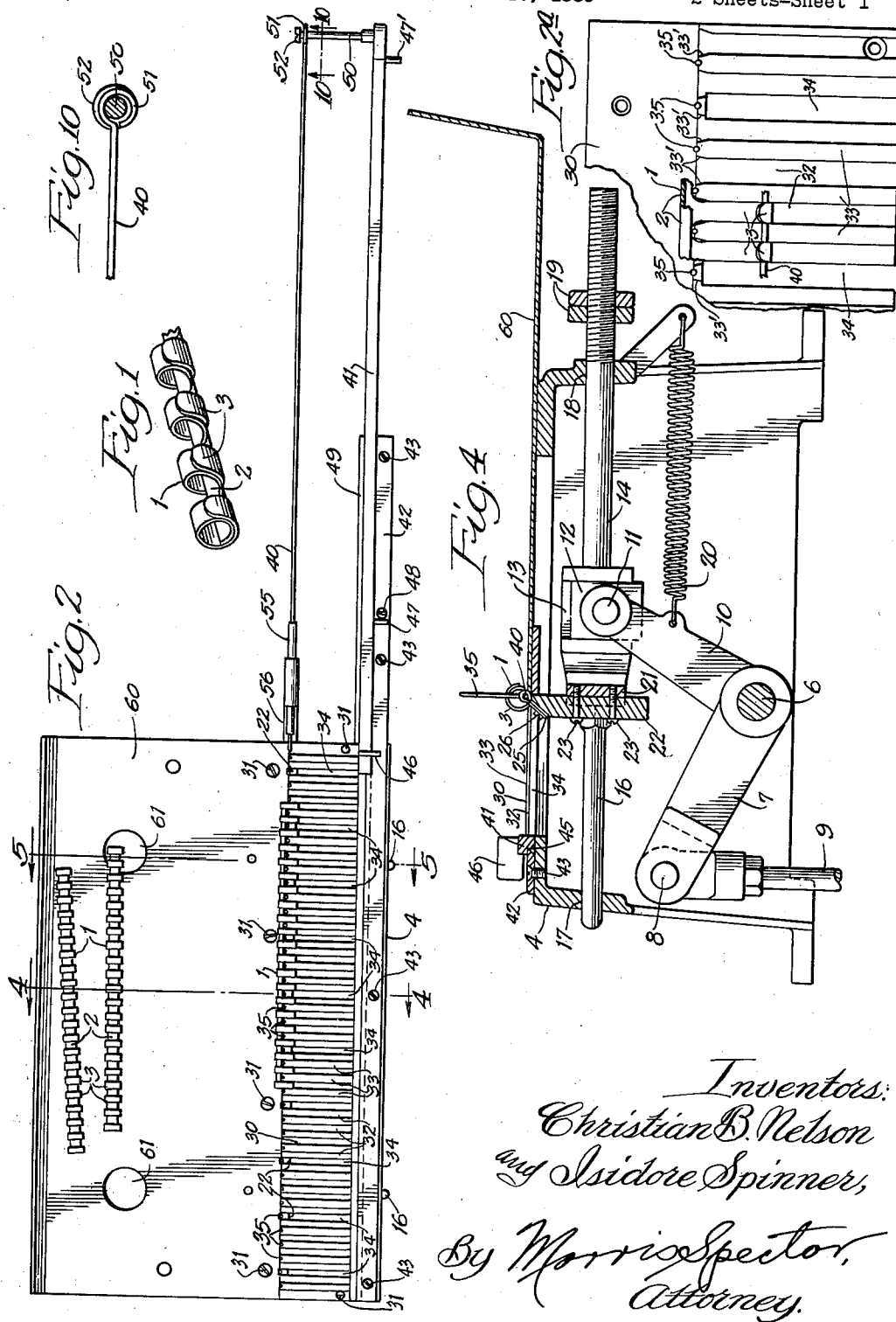
C. B. NELSON ET AL

2,334,433

BINDING MACHINE

Filed Oct. 16, 1939

2 Sheets-Sheet 1



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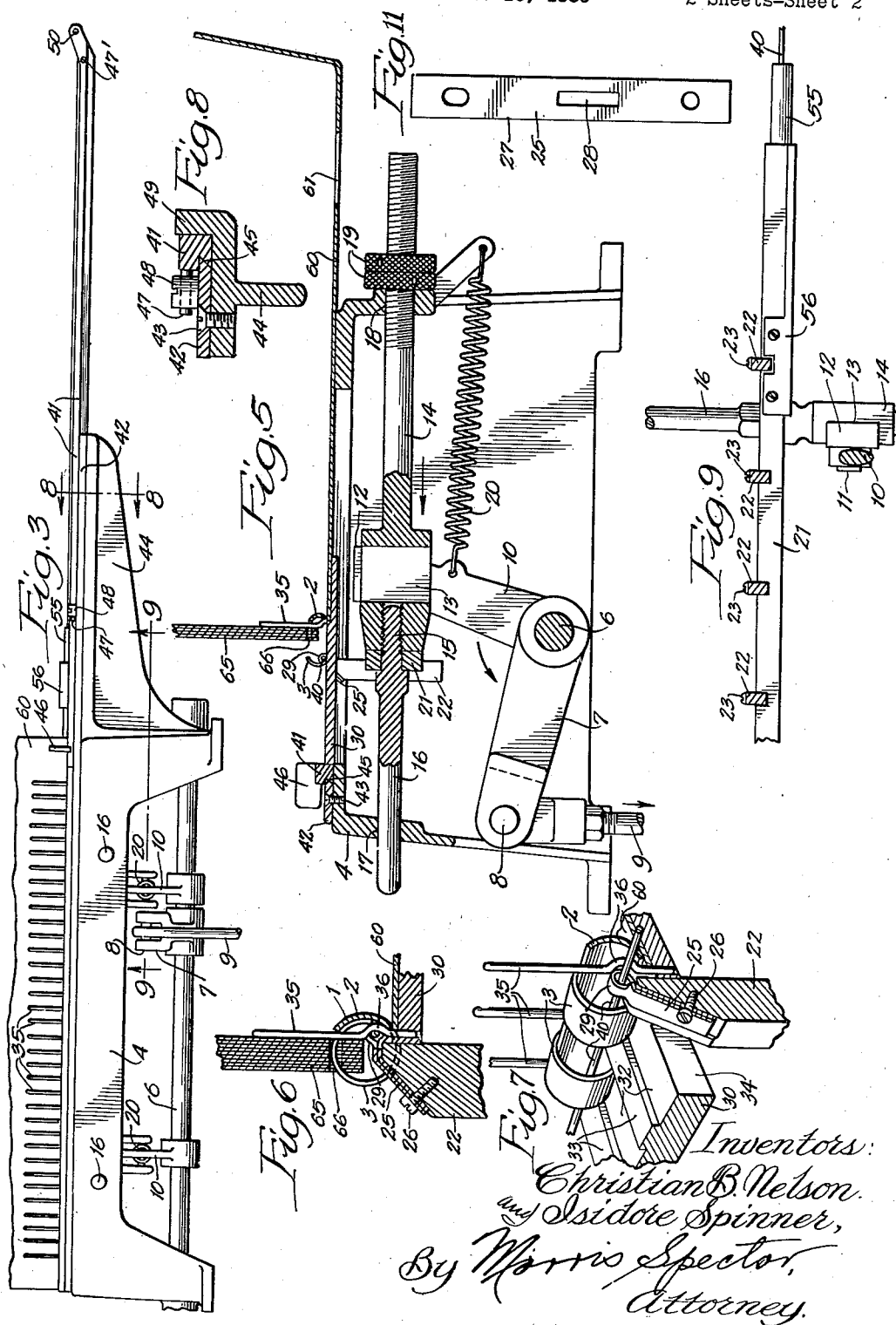
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,334,433

BINDING MACHINE

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1 Claim. (Cl. 11—1)

This invention relates generally to binding machines and more particularly to machines of the type shown in our Patent No. 2,108,136 issued February 15, 1938. The machine of the present invention is used for inserting a resilient tubular binder into a pack of perforated sheets to be secured by the binder. One binder which may be used with the present machine is illustrated in United States Patent No. 1,970,285, issued August 14, 1934, to R. M. L. Douvry. The binder comprises a back having a number of fingers extending therefrom and curled to a tubular form. The material has sufficient resiliency to permit the fingers to be spread open to receive a stack of pages and upon release will resume the curled form under their own resiliency.

The machine of the present invention facilitates the spreading open of such a binder, holds it in its uncurled position while a pack of perforated sheets is placed in proper position for binding, retains the fingers in alignment during uncurling thereof, and allows the fingers to recur and pass through the perforations in the aligned sheets.

It is one of the objects of the present invention to provide a machine of the above mentioned character wherein the resilient binder may be readily inserted in place and quickly uncurled for receiving the stack of pages. In the embodiment of the invention herein illustrated the uncurling operation is performed by inserting a wire longitudinally through the curled tubular form and then gripping the wire at a number of places between teeth and drawing the wire away from the back of the stack to cause the wire to uncurl the teeth. It is one of the objects of the present invention to provide a simple and rapid means for insertion and removal of this wire.

When binders of the above mentioned character are uncurled, particularly binders of large diameter, the free ends of the teeth are at a considerable distance from the back of the binder. Any small amount of side movement of the teeth will bring the ends of the teeth out of alignment with the perforations in the stack of pages, thus rendering difficult the insertion of the binder teeth through the stack of pages. It is one of the objects of the present invention to provide a machine which will hold the individual teeth against side movement during the uncurling and recurring operations, thus assuring the maintenance of proper alignment between the ends of the teeth and the perforations in the stack of pages.

It is a further object of the present invention

to provide a machine of the above mentioned character which can be used for inserting binders of very large diameter and also for inserting binders of exceedingly small diameter, without requiring any adjustment of the machine.

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 perspective view of a portion of a binder used with the machine of the present invention;

Figure 2 is a plan view of a binding machine embodying the principles of the present invention;

Figure 2A is an enlarged plan view of a part of the top plate of Figure 2;

Figure 3 is a front view of the machine of Figure 2;

Figure 4 is a sectional view taken along the line 4—4 of Figure 2 showing the mechanism in normal or released position;

Figure 5 is a view corresponding to Figure 4 and showing the mechanism in retracted position, said view being taken along the line 5—5 of Figure 2;

Figure 6 is an enlarged sectional view showing the relation between the spreader pins and the hook supports when a binder has been inserted through a stack of sheets;

Figure 7 is an enlarged fragmentary perspective view showing the position of the binder in the machine;

Figure 8 is a sectional view taken along the line 8—8 of Figure 3;

Figure 9 is a fragmentary sectional view taken along the line 9—9 of Figure 3;

Figure 10 is a sectional view taken along the line 10—10 of Figure 2; and

Figure 11 is a plan view of a spring hook before the same has been bent to shape.

Like reference numerals refer to like parts throughout the specification and drawings.

Referring to Figure 1, the binder 1 consists of a band or strip forming a back portion 2 and a plurality of uniformly spaced apart fingers 3. 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 resiliency to cause it to recur 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 resilient limits of the material.

Reference may now be had more particularly to Figures 2 to 11 inclusive, which illustrate a binder inserting machine embodying the principles of the present invention. The machine includes a supporting base 4 comprising the main frame of the machine. The supporting base or main frame is of the shape of a housing adapted to house and support the various machine parts. An operating shaft 6 is journaled in the sides of the main frame and is turned by a foot pedal operating lever 7 keyed thereto and connected by a pivot pin 8 to a connecting rod 9 that is adapted to connect with a foot treadle. A plurality of operating levers 10, in this instance two, are each keyed at one end to the operating shaft 6. At its opposite end each lever 10 has a round hole therethrough in which is journaled a circular shank 11 of a slide block 12. The shank is integral with the slide block. The slide block slides in a milled groove or slot 13 in the head of a guide rod 14. A front guide pin 16 is provided with a threaded shank 15 at its rear end, which threaded shank threads into a threaded bore in the head of the guide rod 14. Each front guide pin 16 slides through a hole 17 in the front of the frame 4, and each guide rod 14 slides through a hole 18 in the rear of the main frame 4, the main frame thereby supporting the guide rods and guide pins. Upon rotation of the shaft 6 in a counter-clockwise direction the crank 10 moves the guide rod 14 forwardly. A pair of lock nuts 19 are adjustably threaded on each guide rod 14 and limit the forward movement of the guide rod by abutting against the back of the main frame 4. Springs 20 are provided for effecting a return movement of the guide rods.

A hook support carrier bar 21 fits against the forward end of the head of the guide rods 14 and is provided with oversized openings through which the threaded shanks 15 of the front guide pins 16 extend. The heads of the two front guide pins 16 serve to clamp the hook support carrier bar against the head of the guide rods 14 thus holding the hook support carrier bar 21 in position. A plurality of spreader hook supports 22 are secured to the hook support carrier bar 21, as by individual pairs of screws 23 passing through the respective spreader hook supports. The top of each spreader hook support 22 is beveled off at an angle approximately 45°, as may be seen in Figures 6 and 7. A spreader hook 25 is secured to each spreader hook support 22 in any desired manner, as by screws 26. Each hook 25 consists of a piece of spring steel 27, illustrated more fully in Figure 11, having a slot 28 therein. The strip of spring metal 27 is bent upon itself to lie on the beveled surface of the hook support and form a circular eye 29, which eye is slotted by the slot 28 for a purpose to be more fully set forth as this description proceeds.

A top plate 30 is suitably secured to the top of the main frame adjacent the front of the frame, in any desired manner as by four screws 31, one in each corner of the top plate. The top plate has a number of uniformly spaced grooves 32 formed therein, of uniform width, forming ridges 33 between adjacent grooves. Each groove 32 is of a width sufficient to receive one of the teeth or fingers 3 of the binder, and each ridge 33 is of a width approximately equal to the space between adjacent fingers 3 of the binder. In addition the top plate 30 has a number of uniformly spaced

slots 34 extending therethrough parallel to the grooves and ridges 32—33. Each slot 34 is located at a position that would otherwise be occupied by a ridge 33 had the slot not been provided, and each slot is of a width slightly in excess of the width of each ridge. The spreader hook supports 22 extend through the slots 34 of the top plate 30.

A row of spring wire spreader pins 35 are mounted in the plate 30, a pin being located at the back of each ridge 33 and at the back of each slot 34, all the pins 35 being in alignment. The spreader pins 35 are press fitted into circular holes in the top plate 30 and are uniformly spaced apart the same as the spacing between the fingers 3 of the comb or binder. Each spreader pin 35 has a rearwardly extending semi-circular kink or curve 36 therein adjacent the base thereof, that is, adjacent the top plate 30, for a purpose which will be apparent as this description proceeds.

When the machine is in its normal released position the spreader hooks 25 are in the positions illustrated in Figures 6 and 7, with respect to the spring wire spreader pins 35. The width of the slot 28 in the eye of the spreader hook 25 is sufficient to enable the slot 28 to embrace the pin 35, as may be seen from Figure 6. For this purpose the slot 28 is made of a width only slightly in excess of the diameter of the spreader pin 35. The circular eyes 29 of the respective spreader hooks 25 are in alignment with another so that a rod or wire 40 may be passed through all of the eyes.

A description will now be given of the manner of supporting and guiding the rod 40. A wire guide bar 41 is mounted on the frame 4 between the top plate 30 and a guide bar slide 42, which is secured to the frame by screws 43 that extend into the frame 4 and into an angle support 44 that is secured to the frame 4. The guide bar slide 42 is beveled on its underside, as indicated at 45, with the beveled corner fitting into a milled slot in the guide bar 41, thus holding the guide bar 41 against movement forwardly or rearwardly of the frame. The guide bar 41 has a thumb plate 46 secured thereto whereby it may be gripped for sliding movement transversely of the machine, and it has a pair of pins 47—47' that cooperate with a pin 48 in the guide bar slide 42 for limiting the movement of the guide bar in each direction. The angle support 44 has a flange 49 at the top rear thereof for guiding the rear side of the guide bar 41. At its right hand, as seen in Figure 2, the guide bar 41 has a wire guide pin 50 secured thereto. The rod 40 has an eye or loop 51 at one end, which loosely and slidably embraces the wire guide pin 50, and is held against retraction from the pin 50 by the head of a screw 52 that threads into the pin 50.

A guide tube 55 is mounted at the upper end of a guide tube bracket 56 that is secured to the hook support carrier bar 21, in a position with the guide tube in alignment with the eyes 21 of the spreader hooks 25. The forward end of the rod 40 slides freely through the guide tube 55. It is thus apparent that as the guide bar 41 is moved to the left from the position illustrated in Figure 2, the rod 40, guided through the guide tube 55, will pass through the respective eyes 29 of the spreader hooks 25.

A feeder plate 60 is secured to the frame 4 and constitutes a support for stacks of pages to be bound or for binders, as illustrated in Figure 2. The forward end of the feeder plate over-

lies the rear of the top plate 30. The plate 60 is provided with holes 61 in alignment with the guide rods 14 to facilitate adjustment of the lock nuts 19 on the guide rods from above the machine.

An explanation will now be given of the manner of inserting a binder in a stack of pages having aligned perforations, by means of the machine of the present invention. A binder such as is illustrated in Figure 1 is positioned on the top plate 30 of the machine, with the back portion 2 of the binder rearwardly of the spring wire spreader pins 35, and with the pins 35 extending through the spaces between adjacent fingers 3 of the binder so that the fingers 3 of the binder lie over the grooves 32 of the top plate, and the ridges 33 extend into the space between the fingers of the binder. The guide bar 41 is then slid to the left from the position illustrated in Figure 2, thus sliding the wire 40 through the guide tube 55 into the eyes 27 of the respective spreader hooks 25, the rod 40 passing into the binder. The connecting rod 9 is then pulled downwardly, as by operating the foot treadle, thus rotating the operating shaft 6 in a direction counter-clockwise as seen in Figure 5. The lock nuts 19 are adjusted on the guide rods 4 for the size of binder used so that the lock nuts abut against the frame 4 and limit the movement of the mechanism to such an extent that the fingers of the binder are spread sufficiently to permit insertion of a stack of sheets to be bound but without allowing the ends of the fingers 3 to escape from under the rod 40. A stack of pages 65, to be bound, having aligned perforations 66 spaced apart corresponding to the spacings of the fingers 3 of the binder and of a width sufficient to receive the fingers 3, is then positioned over the top plate 30, against the pins 35, in the manner illustrated in Figures 5 and 6, so that the slots or perforations in the stack of pages are in a position to receive the fingers 3 of the binder when the binder is permitted to recurl. Thereafter the operator permits the connecting rod 9 to rise, under the action of the spring 20, thus causing the rod 40 and the spreader hooks 25 to move towards their initial position, that is, the position illustrated in Figure 4. The binder has sufficient resiliency so that its resilient limit has not been exceeded when it has been uncurled to the position illustrated in Figure 5, and will recurl under its own resiliency to its original tubular shape when the uncurling force is released. Therefore as the spreader fingers and the rod 40 move from the position illustrated in Figure 5 to the position illustrated in Figure 4 the fingers recurl and pass through the perforations 66. If the operator has positioned the stack of pages 65 slightly too high or too low with respect to the fingers 3 she can soon notice this and appropriately raise or lower the stack of pages.

It is to be noted that the pins 35 are located at the very ends of the ridges 33, as may be seen more fully in Figure 2A. The ends of the ridges 33 are milled off slightly, as indicated at 33', so that the ridges are of slightly less width at their rearmost end although of the same height above the bases of the grooves 32. When the binder 1 is positioned on the inserting machine with the pins 35 extending through the spaces between adjacent fingers 3, the tapered edges 33' of the ridges 33 fit into the curved spaces at the crotches between two adjacent

fingers so that the back 2 of the binder lies on the plate 60 with the fingers 3 lying in the grooves 32 and the crotches between adjacent fingers 3 bearing against the pins 35 and adjacent the rear ends of the ridges 33. This assures proper positioning of the binder in the uncurled machine.

During the uncurling operation the fingers 3 roll in the grooves 32 wherein they fit, and are thus held by the ridges 33 against side movement. During the recurling operation the ridges 33 maintain the fingers in parallel alignment so that the fingers always come opposite the perforations 66 in the stack of pages to be bound. After the pages have been bound, as illustrated in Figure 6, the guide bar 41 is again moved to the right, back to the position illustrated in Figure 1, so that the rod or wire 40 is withdrawn from the eyes 27 in the spreader hooks 25, thus permitting the withdrawal of the stack of pages 65 together with the binder 1.

An assembled book or stack of pages can be disassembled in a manner similar to the assembly operation, as may be necessary for the removal or addition of a sheet. The assembled book is first positioned against the pins 35, as illustrated in Figure 6, with the pins passing between adjacent fingers 3 and between the back sheet and the back 2 of the binder. The rod or wire 40 is then slid through the eyes 29, to the position illustrated in Figure 6, and the fingers are spread open as before, the fingers being thus withdrawn from the perforations in the stack of sheets, thereby permitting withdrawal of the stack of sheets from the binder while the binder is held in the machine by the rod 40. The fingers may then be permitted to recurl and the rod 40 then be withdrawn from the eyes 29, thus permitting removal of the binder from the machine.

It is to be noted that because of the curved portions 36 in the spreader pins 35 and because of the slots 28 in the spreader hooks the rod or wire 40 may be positioned closer to the back portion 2 of the binder than would be possible if the wire 35 did not have the kink or curved portion 36, or if the eyes 29 in the spreader hooks 25 did not have the slots 28. By reason of this fact binders of much smaller diameter may be used on the machine described than would be possible if the pins 35 were straight. This is so because the slots 28 in the spreader hooks 25 permit the circular eyes 29 to move closer to the back 2 of the binder, hence they do not project as far forwardly of the pins 35 as would be the case if the slots 28 were omitted. Thus it is possible to use very small diameter binders on the machine above described, that is, binders having a minimum diameter only slightly in excess of the diameter of the eyes 29. Also, by reason of the guiding grooves or slots 32 in the table 30, it is possible to use binders of very large diameter with the assurance that as the fingers are uncurled and recurl they will not under any circumstances flex sideways on the table.

During the use of the machine, the rod or wire 40 is always guided by the tube 55, which is always in alignment with the eyes 29, so that the rod 40 can readily be slid into position extending through all of the eyes 29 by moving the guide bar 41 to the left. When the machine is operated to uncurl the fingers of the binder the guide tube 55 moves with the hook support carrier bar 21. At that time the loop 51 of the rod or wire 41 slides on the pin 50 carried by the guide bar slide

41. This permits a ready manipulation of the machine.

While I have herein described the machine of the present invention as used in connection with a binder of the type shown in the patent to Douvry, above referred to, it is to be understood that the machine may be used for uncurling various different kinds of binders.

In compliance with the requirements of the patent statutes we have here shown and described a preferred embodiment of our invention. It is, however, to be understood that the invention is not limited to the precise construction here shown, the same being merely illus-

trative of the principles of the invention. What we consider new and desire to secure by Letters Patent is:

5 A device of the class described, comprising means supporting a row of spaced apart pins, a plurality of wire receiving loops, means maintain-
10 ing the loops in alignment parallel to said row of pins, each loop having a slot therein opposite a pin so that the loop is movable into a position rearward of the forward end of a pin and embracing a pin, and means for moving said loops in unison toward or away from said row of pins.

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