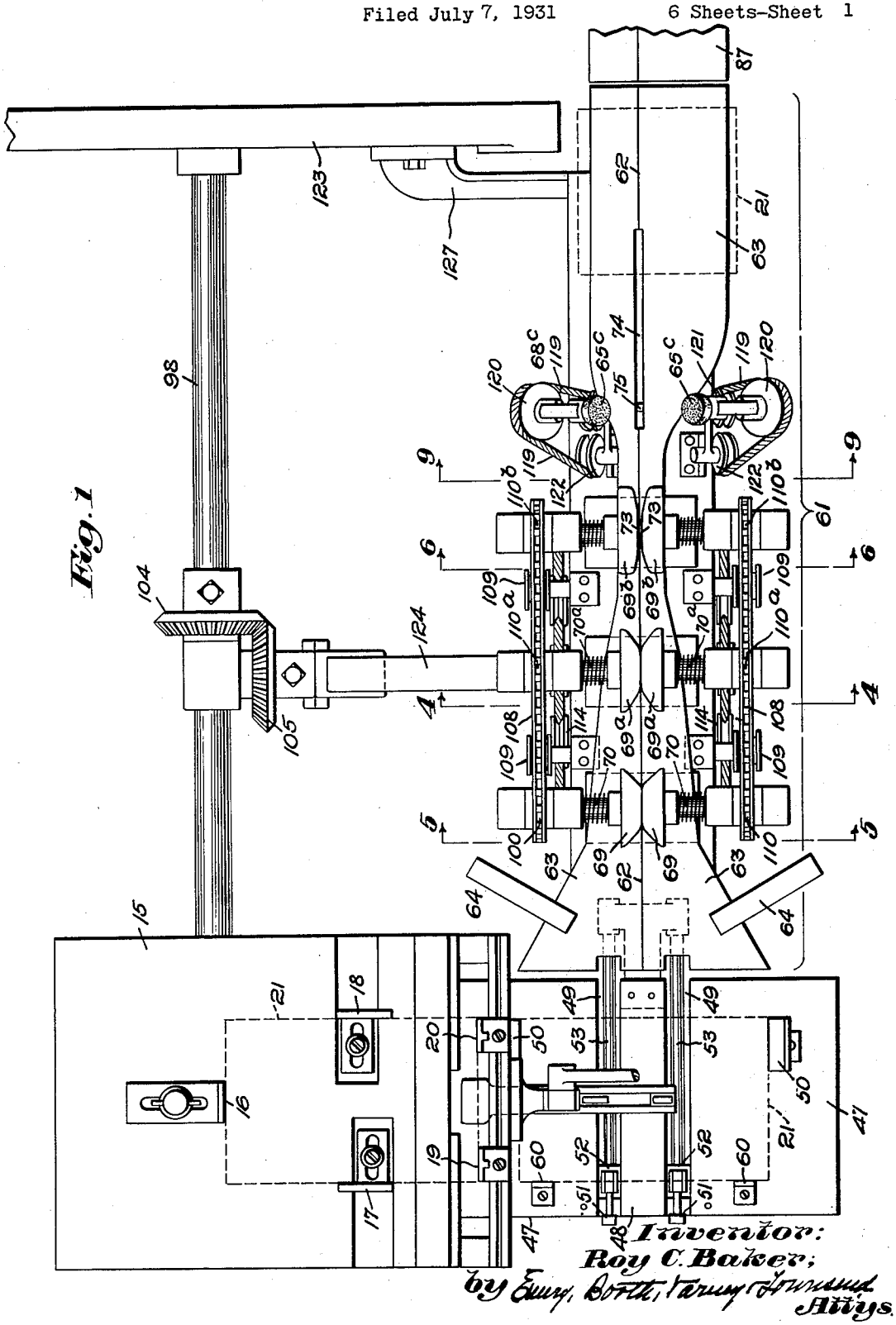
Jan. 30, 1934. R. C. BAKER 1,945,253

MACHINE FOR FOLDING AND FEEDING BOOK SIGNATURES

Filed July 7, 1931 6 Sheets-Sheet 1

Fig. 1



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MACHINE FOR FOLDING AND FEEDING BOOK SIGNATURES

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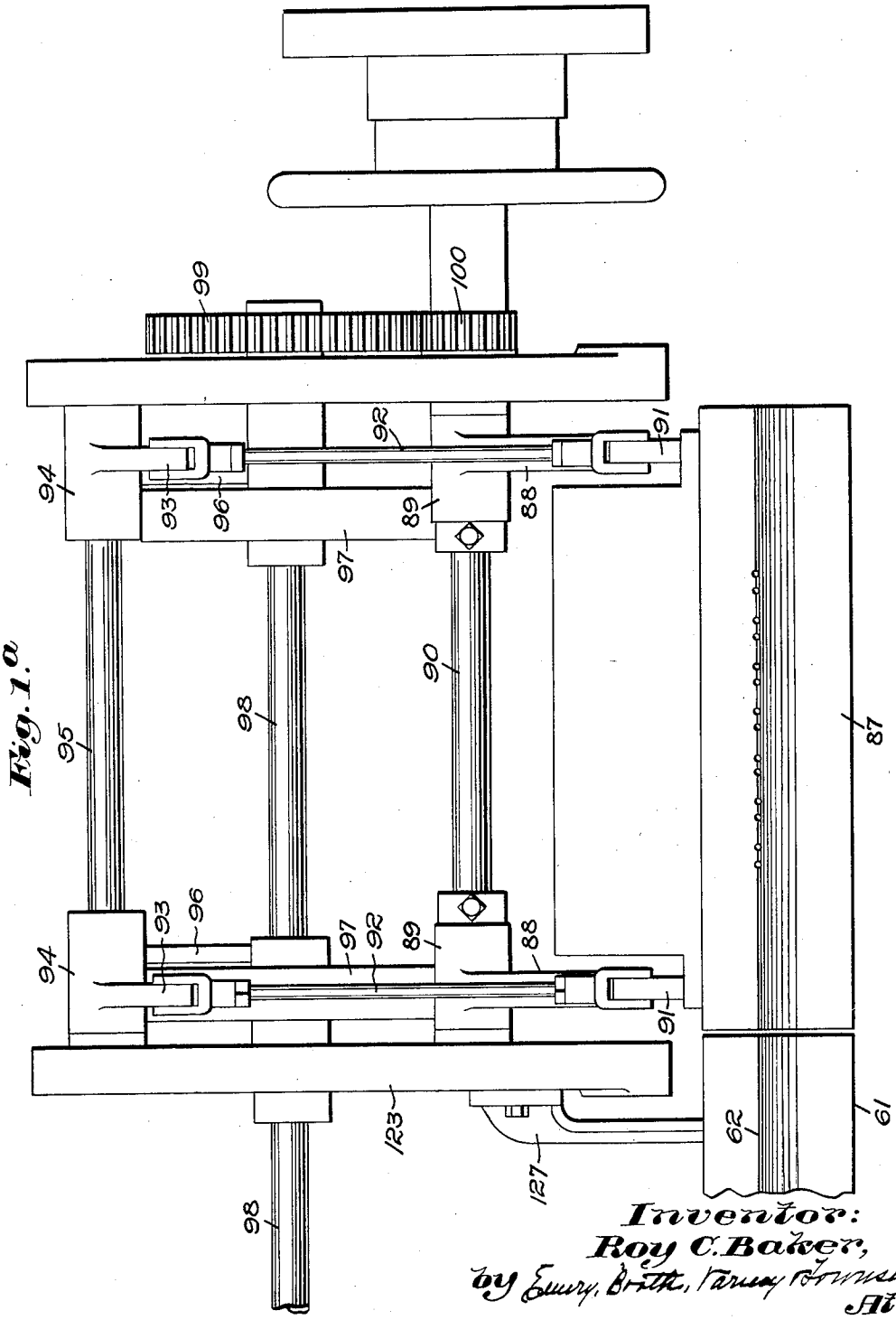


Fig. 1.a

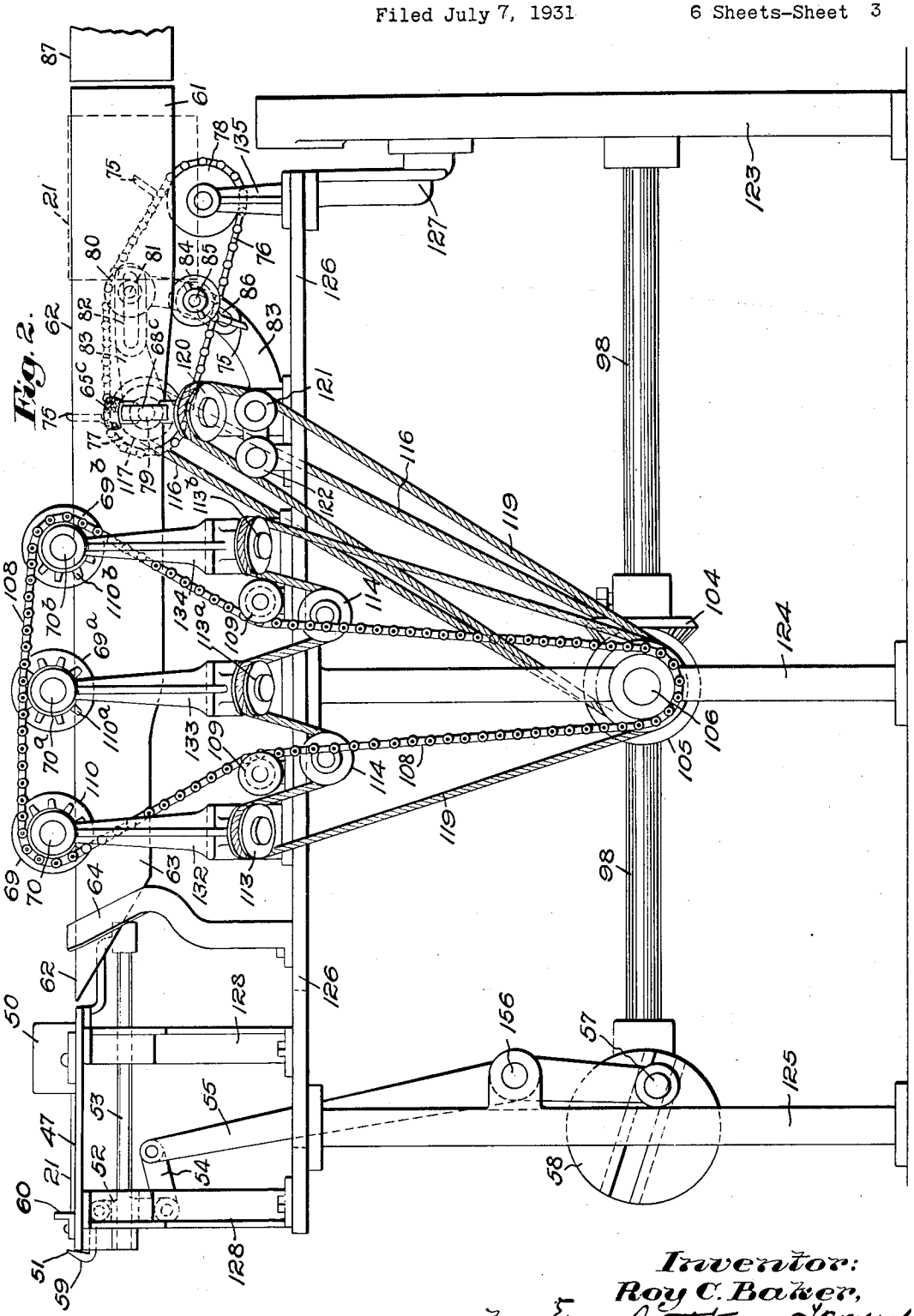
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MACHINE FOR FOLDING AND FEEDING BOOK SIGNATURES

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Fig. 2.



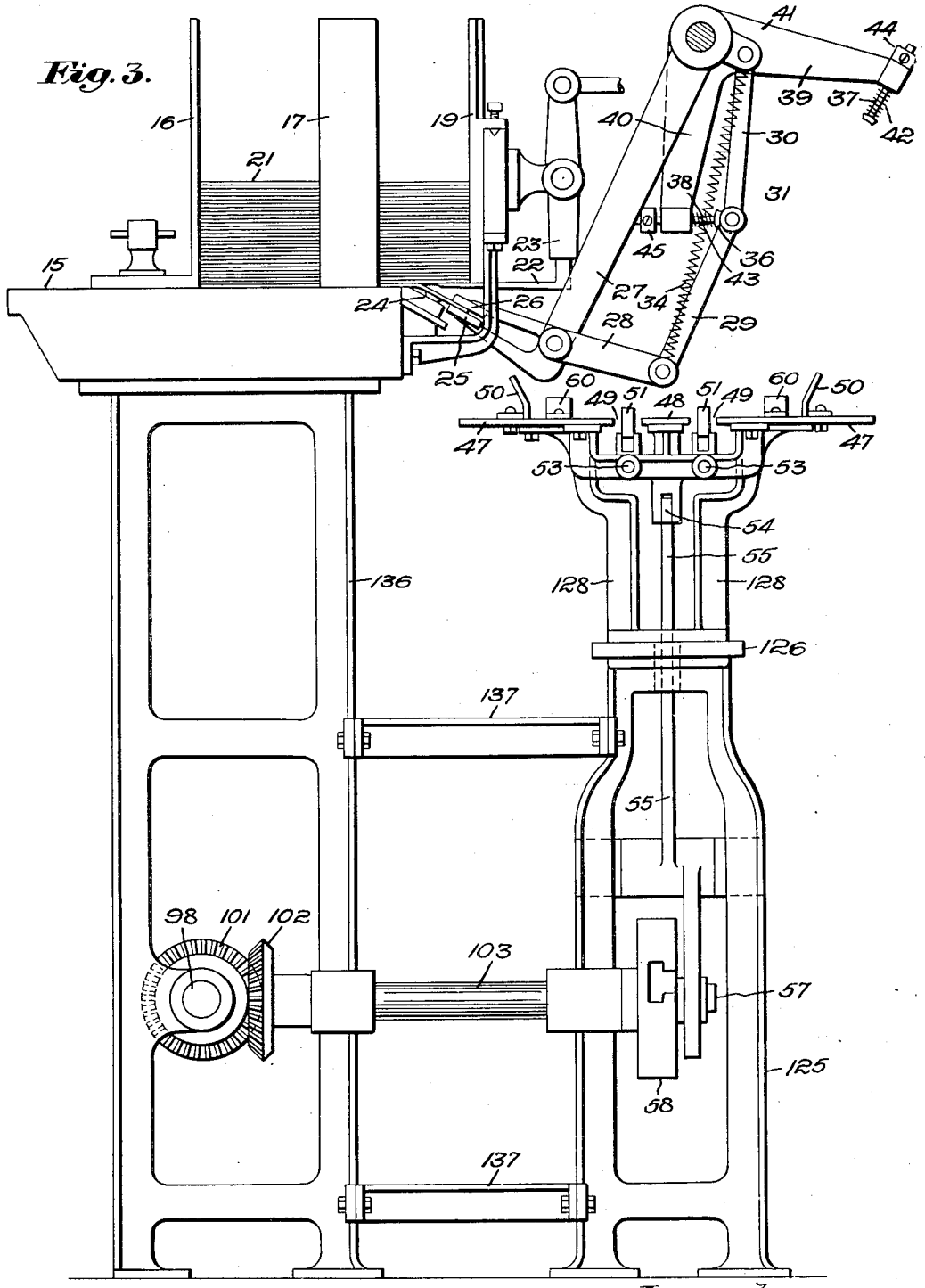
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MACHINE FOR FOLDING AND FEEDING BOOK SIGNATURES

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Fig. 3.



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MACHINE FOR FOLDING AND FEEDING BOOK SIGNATURES

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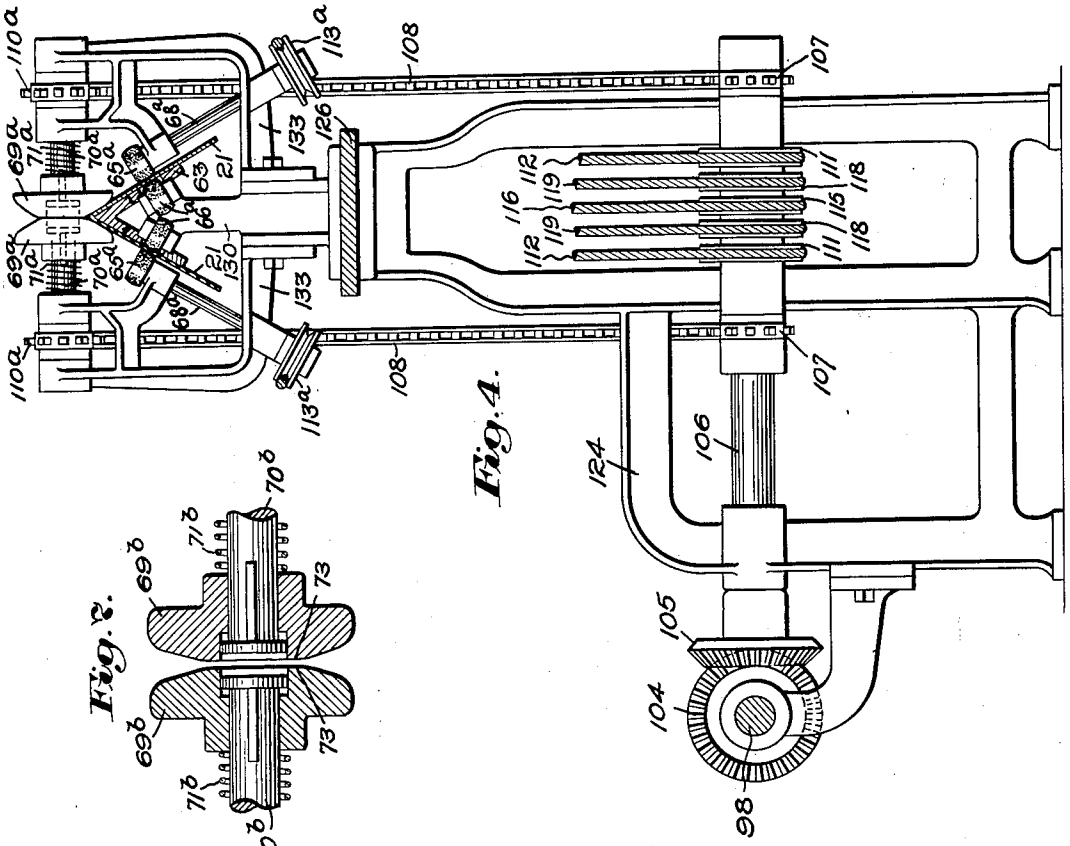


Fig. 4.

Fig. 2.

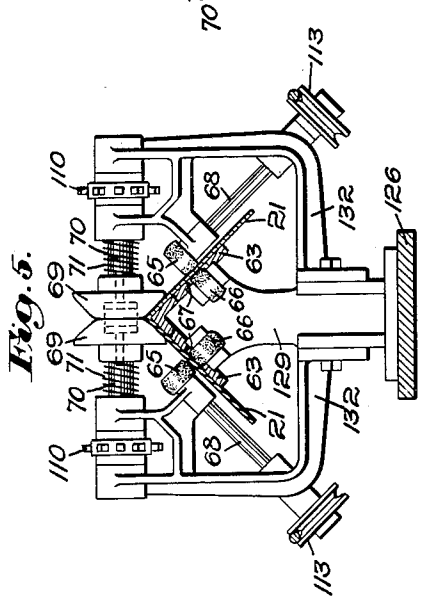


Fig. 5.

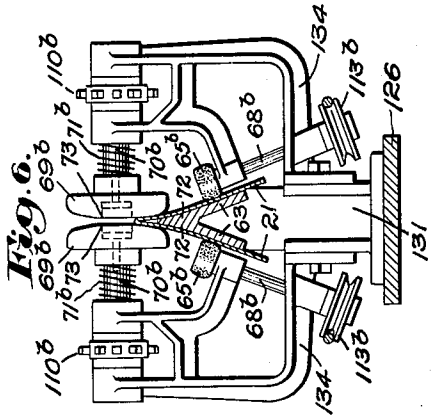


Fig. 6.

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MACHINE FOR FOLDING AND FEEDING BOOK SIGNATURES

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Fig. 8.

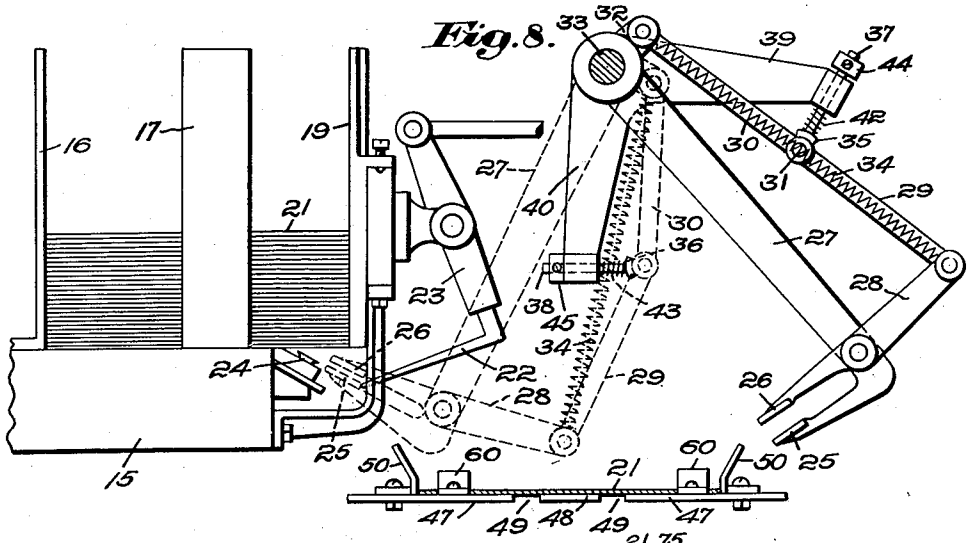


Fig. 9.

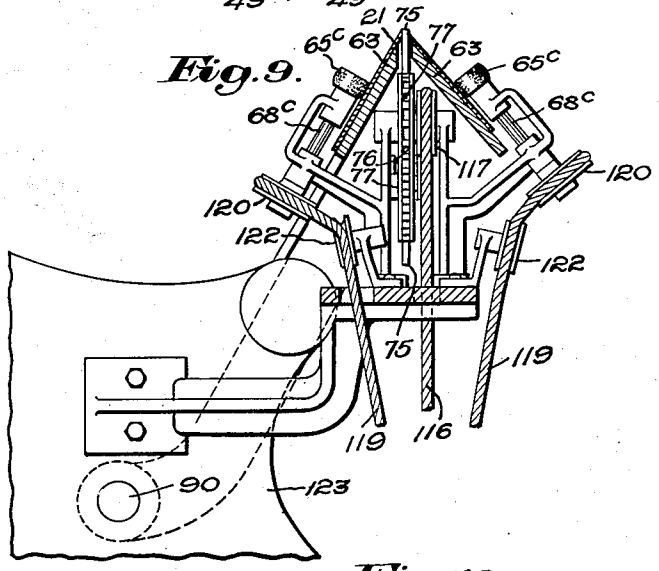
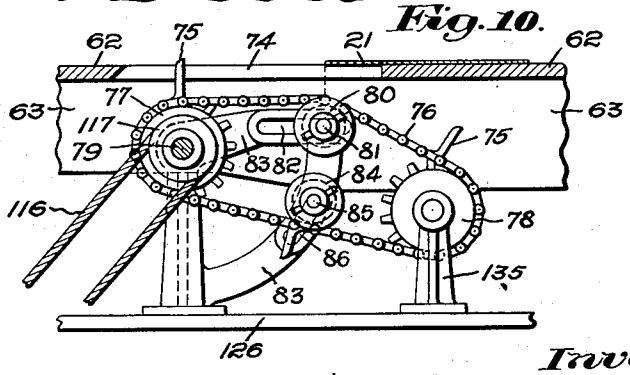


Fig. 10.



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Patented Jan. 30, 1934

1,945,253

UNITED STATES PATENT OFFICE

1,945,253

MACHINE FOR FOLDING AND FEEDING BOOK SIGNATURES

Roy C. Baker, Wollaston, Mass.

Application July 7, 1931. Serial No. 549,179

10 Claims. (Cl. 270—37)

This invention relates to a machine for folding book signatures, and feeding them to a book-fastening machine. Heretofore, it has been customary in the operation of book-fastening machines for the operator to take a signature previously folded by a folding machine, to unfold the signature sufficiently, and then to place the signature either upon a swinging saddle of the fastening machine, or upon an auxiliary saddle, whence it is fed to the swinging saddle. The unfolding of the previously folded signature is a matter which requires considerable dexterity, and occupies an appreciable amount of time, thus limiting the speed at which the fastening machine can be operated.

My invention obviates the step of unfolding the signature previously completely folded by a separate machine by providing a machine which makes the final fold in the signature and feeds it to a fixed auxiliary saddle in readiness to be moved onto the swinging saddle, which then presents the signature to the sewing mechanism of the fastening machine.

The invention will best be understood by reference to the following description, when taken in connection with the accompanying drawings of one specific embodiment thereof, while its scope will be pointed out more particularly in the appended claims.

In the drawings:—

Fig. 1 is a plan of a signature folding and feeding machine embodying the invention;

Fig. 1a is a plan of a portion of my machine and a portion of a known book fastening machine, the two machines being connected together so that one drives and is synchronized with the other;

Fig. 2 is a front elevation of the machine;

Fig. 3 is an elevation of the machine as viewed from the left-hand side of Fig. 2;

Fig. 4 is a sectional view on line 4—4 of Fig. 1;

Fig. 5 is a sectional view on line 5—5 of Fig. 1;

Fig. 6 is a sectional view on line 6—6 of Fig. 1;

Fig. 7 is a sectional view, on an enlarged scale, on line 7—7 of Fig. 1;

Fig. 8 is an elevation, partly in section, of a portion of Fig. 3, but showing the parts in a different position;

Fig. 9 is a sectional view on line 9—9 of Fig. 1; and

Fig. 10 is a sectional view on line 10—10 of Fig. 1.

Referring to the drawings, and to the embodiment of the invention which is illustrated therein, and having reference at first to Fig. 1, there is shown a folding and feeding machine having a magazine (see the upper left-hand portion of Fig. 1) comprising a table 15 and a set of adjustable, vertical guides 16, 17, 18, 19 and 20, to receive a pile of signatures 21, which have been folded in a folding machine, but the usual final fold has been omitted.

Referring now to Fig. 3, it will be observed that the pile of signatures overhangs one edge of the table, as is common with magazine feeds of this sort, and there is provided an underlying support in the nature of a finger 22, which normally supports the adjacent margin of the lowermost signature, but can be swung by a lever 23 by which it is carried from the position shown in Fig. 3 to the position shown in Fig. 8. When the finger is thus withdrawn, the unsupported margin of the lowermost signature can then be drawn downwardly by a suction cup 24, connected to an exhausting pump (not shown), whereupon the finger 22 is restored to its initial position (see Fig. 3) to support the next signature. The downwardly deflected margin of the lowermost signature is then grasped between a pair of grippers 25 and 26, which are carried by a swinging arm 27. The gripper 25 is formed on or rigidly affixed to the arm, while the gripper 26 is suitably formed on or secured to a lever 28, the latter being pivoted on the arm. Thus, the grippers act like a pair of pincers, which can be opened to receive the signatures, then closed to grasp the same, then swung to the place where the signature is to be deposited, and finally opened to release the signature.

This opening and closing of the grippers is accomplished by connecting the lever 28 to a toggle comprising a pair of links 29 and 30, which are pivoted to each other at 31, while the link 30 is pivoted to an arm 32, which is secured to a rockshaft 33 to which the arm 27 is also secured. A helically coiled tension spring 34 also connects the lever 28 to the arm 32, and when the toggle is straight (see Fig. 8), lies directly in line with the axis of the pivot 31 which connects the links 29 and 30 of the toggle. The breaking and straightening of the toggle is accomplished by two abutments 35 and 36, alternately engaged by the pivot 31. These abutments are carried by plungers 37 and 38, respectively, slidably mounted in guides presented by arms 39 and 40 of a fixed bracket 41, and there are springs 42 and 43 encircling the plungers, and urging the respective abutments outwardly with relation to their guides, their movement being limited by collars 44 and 45, respectively, secured to the plungers.

The springs cushion the impact of the pivot 31 with the respective abutments 35 and 36.

The grippers 25 and 26, as shown in Fig. 8, are separated, and inasmuch as the spring 34 is in line with the axis of the pivot 31 when the arm 27 swings from the position shown in full lines in Fig. 8 toward the position shown in dotted lines, the grippers will remain separated until they are on opposite sides, respectively, of the downwardly deflected lowermost signature, whereupon the pivot 31 strikes the abutment 36, thus breaking the toggle, and the spring 34 becomes effective to cause the grippers to close upon the signature (see Fig. 3). The grippers remain closed upon the sheet, and the arm 27 then carries the grippers toward the right as viewed in Figs. 3 and 8, until the signature has been carried to the point where it is desired to deposit it, whereupon the pivot 31 strikes the abutment 35 and causes the separation of the grippers and the consequent release of the signature.

The signature is thus deposited upon a second table 46, which comprises two outer sections 47 and an intermediate section 48, the outer sections being separated from the intermediate section by slots 49. The signature is deposited between two upwardly diverging guides 50, and settles down upon the table sections 47 and 48.

After the signature has come to rest on the second table, it is fed by appropriate feeding mechanism such as that now to be described, reference being had to Fig. 3. In each of the slots 49, there is a pusher 51 carried by and rigidly secured to a slide 52, the latter being mounted for reciprocation on two guide rods 53. A reciprocatory motion is given to the slide by suitable mechanism, herein a pair of links 54 connecting the slide to a lever 55, which is pivoted at 56 and is rocked to and fro by a crank pin 57, adjustably mounted in a crank disk 58. As shown in Fig. 1, the starting position of the pushers 51 is some distance from the adjacent edge of the signature lying on the table. When the slide which carries the pushers moves toward the right, the pushers bring up against the edge of the signature and carry the latter toward the right a distance equal to the stroke of the slide and predetermined by the radius of the driving crank. The rear faces of the pushers are bevelled as at 59, to enable them to pass beneath the next signature placed on the table, and to prevent rearward displacement of such signature, there are two upstanding stops 60 mounted on the table sections 47, respectively, to be engaged by the rear edge of the signature.

The pushers slide the signature from the table onto a long saddle 61 (see Fig. 1), which presents a ridge 62 and has angularly related sloping sides 63, the angularity of which varies lengthwise of the saddle. At the first end of the saddle, the slope is comparatively slight, and there are associated with this portion of the saddle two fixed guides 64, beneath which the edges of the signatures pass as the latter is advanced from the table onto and along the saddle. The function of these guides is to commence the folding action by utilizing the forward movement of the signature to cause the latter to be bent increasingly as the movement of the signature progresses.

From here on, there is an increased acuteness of the sloping sides of the saddle, and there are associated with the latter several sets of rollers now to be described, which not only press the signature against the sloping sides to produce a folding action, but also feed the signature lengthwise of the saddle. The first set of rollers is illustrated in Fig. 5. With each of the sloping sides of the saddle, there is associated a pair of rollers 65 and 66, between which the signature passes, these rollers being made of suitable yielding material such as rubber, and so related as to exert a sliding pressure upon the opposite faces of the interposed signature. The rollers 65 press upon the upper faces of the signature, and the rollers 66 project through slots 67 provided in the sloping sides of the saddle. The rollers 65 are mounted on shafts 68, to which power is applied as hereinafter described, and the rollers 66 are simply idlers.

The creasing of the signature along the ridge of the saddle is accomplished by a pair of tapered rollers 69, which are splined on and driven by axially aligned shafts 70, and are urged toward each other by compression springs 71, helically coiled about the shafts. Power is applied to these shafts by mechanism hereinafter described. These rollers not only start the creasing of the signature, but also contribute in the feeding of the latter along the saddle, as the creasing action progresses.

The signature then encounters a second set of rollers and driving mechanism (see Fig. 4), identical in all respects with those shown in Fig. 5 (and therefore bearing the same numerals with the addition of the index *a*), except for the fact that the sides of the saddle have an increased slope,—that is the angle is acute,—and the several rollers correspond in angularity with the increased slope. It is therefore deemed unnecessary to describe this set of rollers and their associated parts.

After passing the second set of rollers, the signature advances to and is seized by the third set of rollers (see Fig. 6), which is identical in all respects with the second (except for the omission of rollers corresponding to the rollers 66*a*), and therefore bearing the same numerals with the index *b*. At this point, there is not only a very extreme acuteness of the angularity of the sides of the saddle, but the sides are also preferably somewhat concaved as at 72, and the rollers 69*b* have opposed surfaces which are partly tapered, as is the case with the other rollers, and also flat parallel faces 73 between which the ridge of the saddle extends, as clearly shown in Fig. 6, as a result of which the signature is folded rather sharply and given a firm crease by the pressure of the rollers 69*b* toward the ridge of the saddle.

The third set of rollers delivers the signatures to another feeding mechanism, which feeds the signature along a portion of the saddle whose sides, as viewed in Fig. 1, become less acutely related, and at the right-hand end of the saddle have the same angularity as the sides of the swinging saddle which is to present the signature to the sewing instrumentalities of the known fastening means. This feeding mechanism will now be described, reference being had at first to Fig. 9. At opposite sides, respectively, of the saddle, there are feed rollers 65*c*, secured to the driving shafts 68*c*, and corresponding to the rollers 65*b* and shafts 68*b*, shown in Fig. 6. Power is applied to these shafts by mechanism hereinafter described, as a result of which the resilient rollers pressing the signature against the sides 63 of the saddle feed the signature along the latter to still another feeding mechanism, which is illustrated in Fig. 10.

Along this portion of the saddle, its ridge is provided with a longitudinal slot 74 to receive successively a series of feed dogs 75 carried by an

endless chain 76 which is trained over sprockets 77 and 78, the latter being an idler while the former is secured to a shaft 79 to which power is applied as hereinafter described. A portion of the upper part of the chain is maintained in a horizontal position by the provision of an idler 80, and to the right of this idler the chain descends rather abruptly to the idler sprocket 78. As a result of this arrangement, each of the feed dogs in succession rises into the slot 74, feeds the signature along the saddle the required distance, and then descends into the slot, leaving the signature in the desired position. As signatures vary in width, (that is to say, lengthwise of the saddle), it is desirable to adjust the feeding mechanism to accommodate signatures of different widths, and to this end, the idler 80 is adjustable lengthwise of the saddle, as by the use of a stud 81 which carries the idler, and which is adjustable lengthwise of a slot 82 in a bracket 83. To compensate for the resulting slack in the chain when the idler 80 is moved toward the left for a shorter feed, there is provided a chain-tightening idler 84, carried by a bolt 85 which is adjustable downwardly in a slot 86 in the bracket 83.

The last-described feeding mechanism leaves the signature in the position shown in dotted lines near the right-hand end of the saddle, whence it may be transferred at the proper time to a swinging saddle 87, a portion of which is shown at the lower right-hand part of Fig. 1. Fig. 1*a* shows the right-hand end of the saddle 61, and the whole of the swinging saddle 87. Fig. 1*a* also shows some portions of a book-fastening machine of known construction of the type exemplified by United States Patent No. 1,458,026 to Bischof. It is deemed unnecessary to describe any of the parts of the fastening machine except those which are directly concerned with my folding and feeding machine. The swinging saddle 87 is mounted on arms 88 which have hubs 89 loosely received on a driving shaft 90 of the fastening machine, and the saddle has imparted to it a forward and backward rocking motion by being provided with ears 91 connected by links 92 to arms 93 of cam levers 94, loosely mounted on a shaft 95 and having arms 96 actuated by cams 97 secured to a shaft 98. The latter is driven by a gear 99, which meshes with a pinion 100 on the driving shaft 90.

In accordance with my invention, the driven shaft 98 is prolonged toward the left, as viewed in Fig. 1*a*, and as shown in Fig. 1 is the power shaft which supplies power to the several mechanisms of my folding and feeding machine. For example, as shown in Fig. 3, there is secured to the end of the shaft 98 a mitre gear 101, which meshes with and drives a mitre gear 102, the latter being secured to a shaft 103 to which the crank disk 58 is secured. This crank, it will be remembered, furnishes the power which drives the feeding mechanism associated with the second table. Referring again to Fig. 1, it will be observed that there is also secured to the shaft 98 a mitre gear 104, which meshes with and drives a mitre gear 105, the latter being secured to a shaft 106. As shown in Fig. 4, there are secured to the shaft 106 two sprocket wheels 107, over which are trained chains 108 which lead upwardly, and, as shown in Fig. 2, over idlers 109. Each chain meshes with and drives three sprocket wheels 110, 110*a* and 110*b*, also shown in Figs. 5, 4 and 6, respectively. The two sprocket wheels 110, as shown in Fig. 5, are secured to the shafts 70, respectively, the sprocket wheels 110*a*, as shown in Fig. 4, are secured to the shafts 70*a*, respectively, and the sprocket wheels 110*b*, as shown in Fig. 6, are secured to the shafts 70*b*, respectively, thus furnishing power to drive the pairs of rolls 69, 69*a* and 69*b*.

Referring now to Fig. 4, it will be observed that there are secured to the shaft 106 two grooved pulleys 111, over which there are trained round belts 112. Each of these belts as shown in Fig. 2 leads upwardly, and is trained over grooved pulleys 113, 113*a* and 113*b*, and over two grooved idlers 114. Referring now to Fig. 5, the grooved pulleys 113 are secured to and drive the shaft 68, respectively, while in Fig. 4, the grooved pulleys 113*a* are shown secured to and driving the shafts 68*a*, respectively, and in Fig. 6, the grooved pulleys 113*b* are secured to and drive the shafts 68*b*, respectively.

Referring again to Fig. 4, there is secured to the shaft 106 a grooved pulley 115, over which there is trained a round belt 116, which leads upwardly and is trained over a grooved pulley 117, the latter being secured to and driving the shaft 79, to which there is also secured the sprocket wheel 77 (see Fig. 10). In this way, power is applied to the feeding mechanism shown in Fig. 10.

Referring once more to Fig. 4, there are secured to the shaft 106 two grooved pulleys 118, over which there are trained round belts 119, the latter, as shown in Fig. 2, leading upwardly and being trained over grooved pulleys 120, which, as shown in Fig. 9, are secured to and drive the shafts 68*c*, respectively. The belts 119 are also trained over idler pulleys 121 and 122, which give to the belt proper leads or directions to enable them to be wrapped on the pulleys 120 which they drive. Thus, power is applied to the shafts 68*c* and to the feeding rollers 65*c* mounted thereon.

The machine has an appropriate framework, a portion of which (see Fig. 2) is an upright 123, which is a part of the frame of the fastening machine. There are also uprights 124 and 125, which support a bed 126, the right-hand end of the latter having a bracket 127, which is supported on the upright 123. Upon this bed there are other uprights 128 which support the second table. This bed also supports the guides 64; it also supports a bracket 129 (see Fig. 5), a bracket 130 (see Fig. 41) and a bracket 131 (see Fig. 6), which in turn support the saddle 61 at three points. The bracket 129 (see Fig. 5) also supports brackets 132, which afford bearings for the shafts 68 and 70, the bracket 130 (see Fig. 4) supports brackets 133, which afford bearings for the shafts 68*a* and 70*a*, and the bracket 131 supports brackets 134 (see Fig. 6), which afford bearings for the shafts 68*b* and 71*b*. The bed 126 also supports the bracket 83 of the last feeding mechanism, and it also supports a bracket 135 for said mechanism.

The upright 124 (see Fig. 3) affords bearings for the shaft 106 (see Fig. 4), and the upright 125 affords a bearing for the shaft 103. There are also uprights 136 (one of which is shown in Fig. 3) which support the first table 15, and which afford bearings for the shafts 98 and 103. As shown in Fig. 3, the upright 136 is connected to the upright 125 by upper and lower tie pieces 137.

The general operation of the machine will now be described, reference being had to Fig. 1. A pile of the signatures is placed upon the first table 15 in the magazine composed of the table and the vertical guides 16, 17, 18, 19 and 20. The lowermost signature is fed from the magazine onto the second table composed of the sections 47

and 48, and it is then fed from this table by the second feeding mechanism, which delivers the signature onto the left-hand end of the long saddle 61. The signature is then carried along the saddle, and is folded and creased by the successive action of the three sets of rollers, after which it is fed by the final feeding rollers to the position where it is engaged by one of the feed dogs projecting through the slot in the ridge of the saddle, and it is finally brought into the position shown in dotted lines at the lower right-hand portion of Fig. 1, in readiness to be slipped onto the swinging saddle when the latter is in registration with the fixed saddle. The swinging saddle then carries the signature to the sewing mechanism in the usual manner.

Having thus described one embodiment of the invention, but without limiting myself thereto, what I claim and desire by Letters Patent to secure is:

1. The combination with a signature fastening machine having a movable saddle, of a signature folding and feeding machine having a saddle aligned with said movable saddle in the initial position of the latter, and means for folding a signature and feeding the same along the second-mentioned saddle toward the first-mentioned saddle.

2. The combination of a stationary saddle, a movable saddle which, in its normal position, registers with said stationary saddle, and means to fold signatures and place them on said stationary saddle in readiness to be transferred along said stationary saddle to said movable saddle.

3. In a machine of the class described, the combination of a primary saddle, a secondary saddle movable into and out of registration with said primary saddle, and means to fold a signature on said primary saddle.

4. In a machine of the class described, the combination of a primary saddle, a secondary saddle movable into and out of registration with said primary saddle, and means to fold a signature on said primary saddle, and to move said signature toward said secondary saddle.

5. In a machine for folding signatures, the combination of a magazine for the signatures, a saddle, means for transferring a signature from said magazine to said saddle, and means for folding said signature on said saddle.

6. In a machine for folding signatures, the combination of a magazine for the signatures, a saddle, means for transferring a signature from said magazine to said saddle, and means for folding said signature on said saddle, and feeding said signature lengthwise of said saddle.

7. In a machine for folding signatures, the combination of a magazine for the signatures, a saddle, means for transferring a signature from said magazine to said saddle, and means for folding said signature on said saddle, and feeding said signatures lengthwise of said saddle while they are being folded.

8. In a machine for folding signatures, the combination of a table on which a signature is placed, a saddle, means to move said signature from said table onto said saddle, and means for folding said signature on said saddle.

9. In a machine for folding signatures, the combination of a table on which a signature is placed, a saddle, means to move said signature from said table onto said saddle, and means for folding said signature on said saddle and feeding said signature lengthwise of said saddle.

10. In a machine for folding signatures, the combination of a magazine for the signatures, a table, means for moving a signature from said magazine to said table, a saddle, means for moving said signature from said table to said saddle, and means for folding said signature on said saddle.

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