Sept. 9, 1958 G. G. GRINNELL 2,850,927

SHEET BINDER

Original Filed Jan. 3, 1941 5 Sheets-Sheet 1

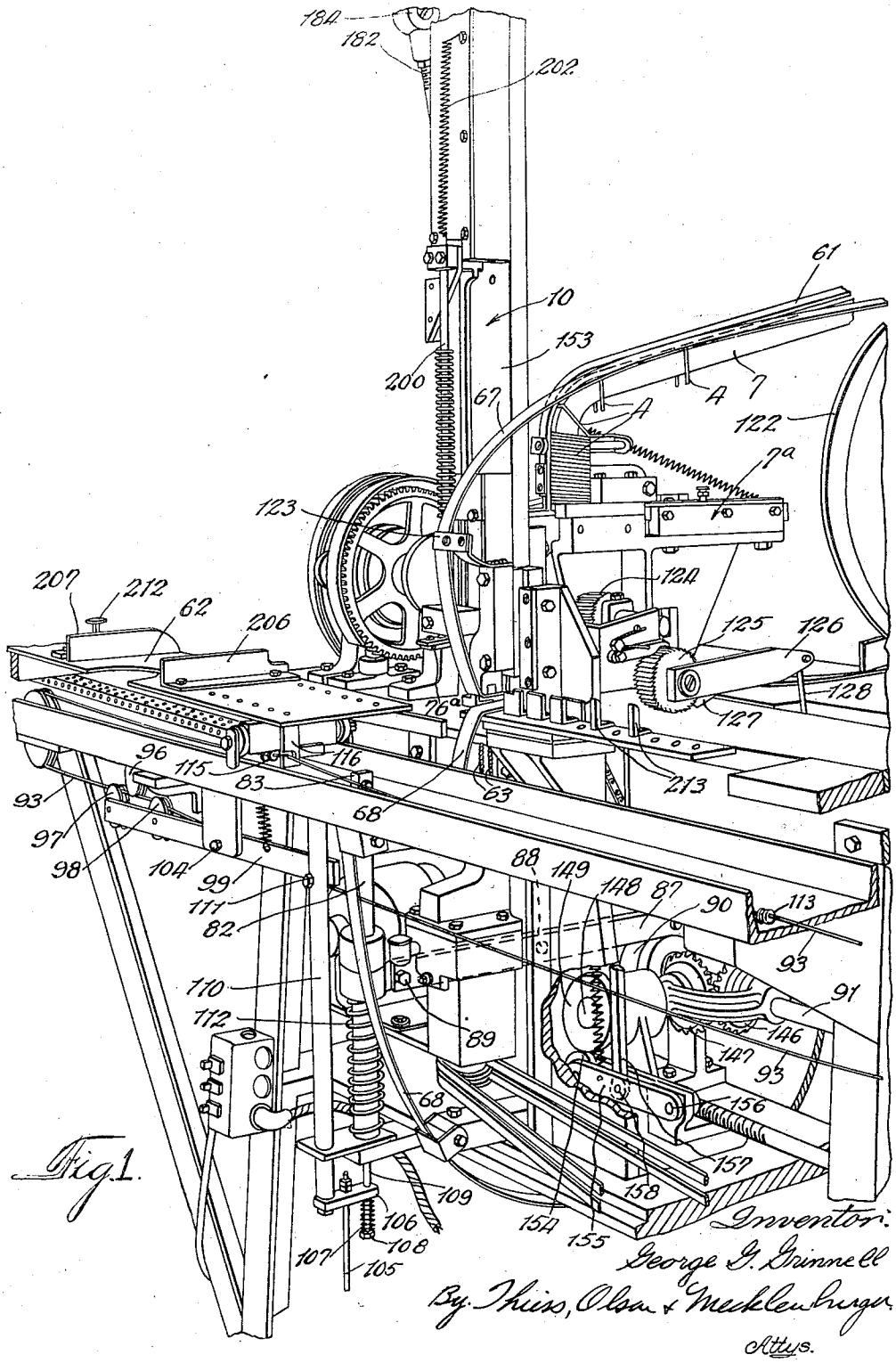

Fig. 1.

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SHEET BINDER

Original Filed Jan. 3, 1941 5 Sheets-Sheet 2

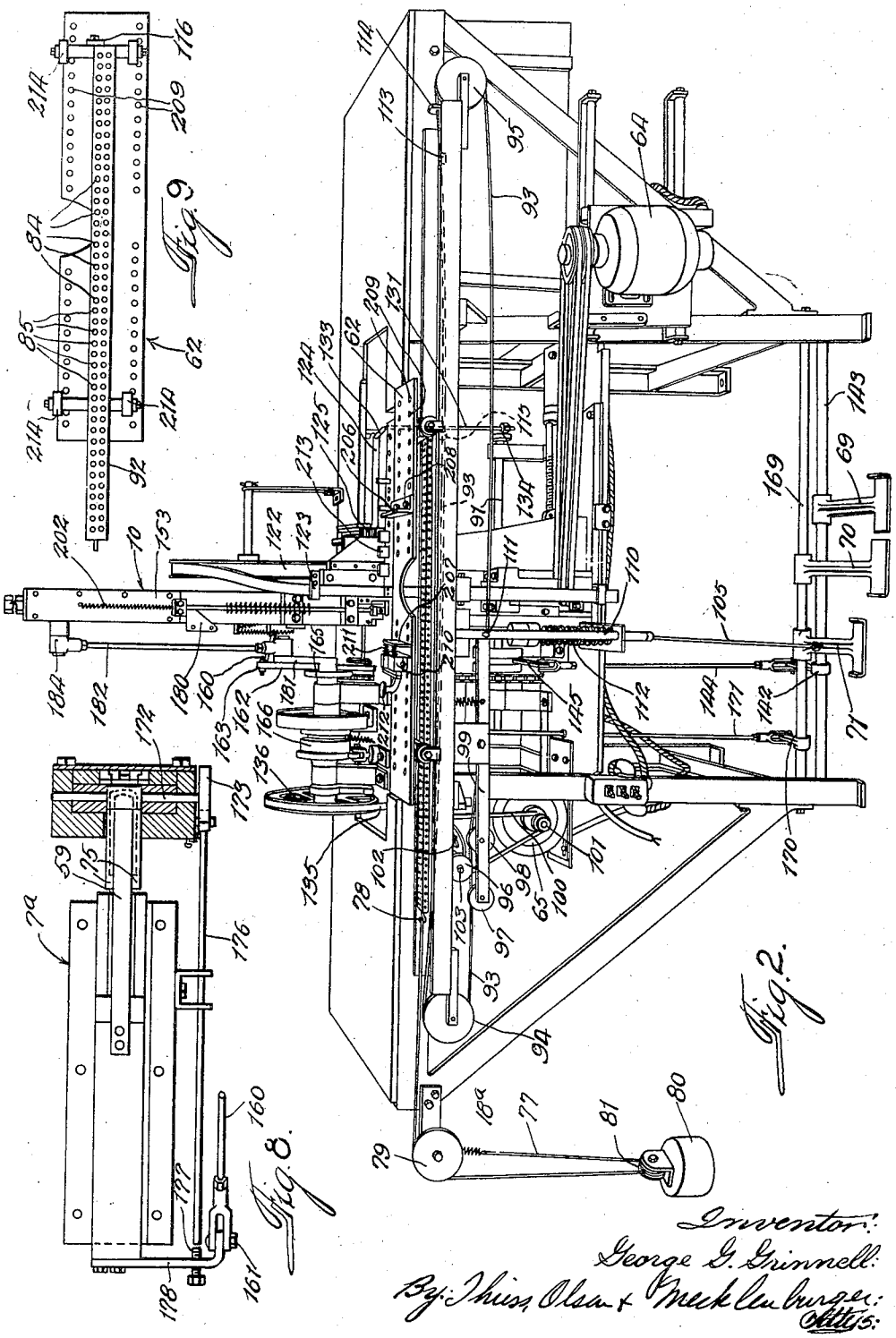

Fig. 2.

Fig. 8.

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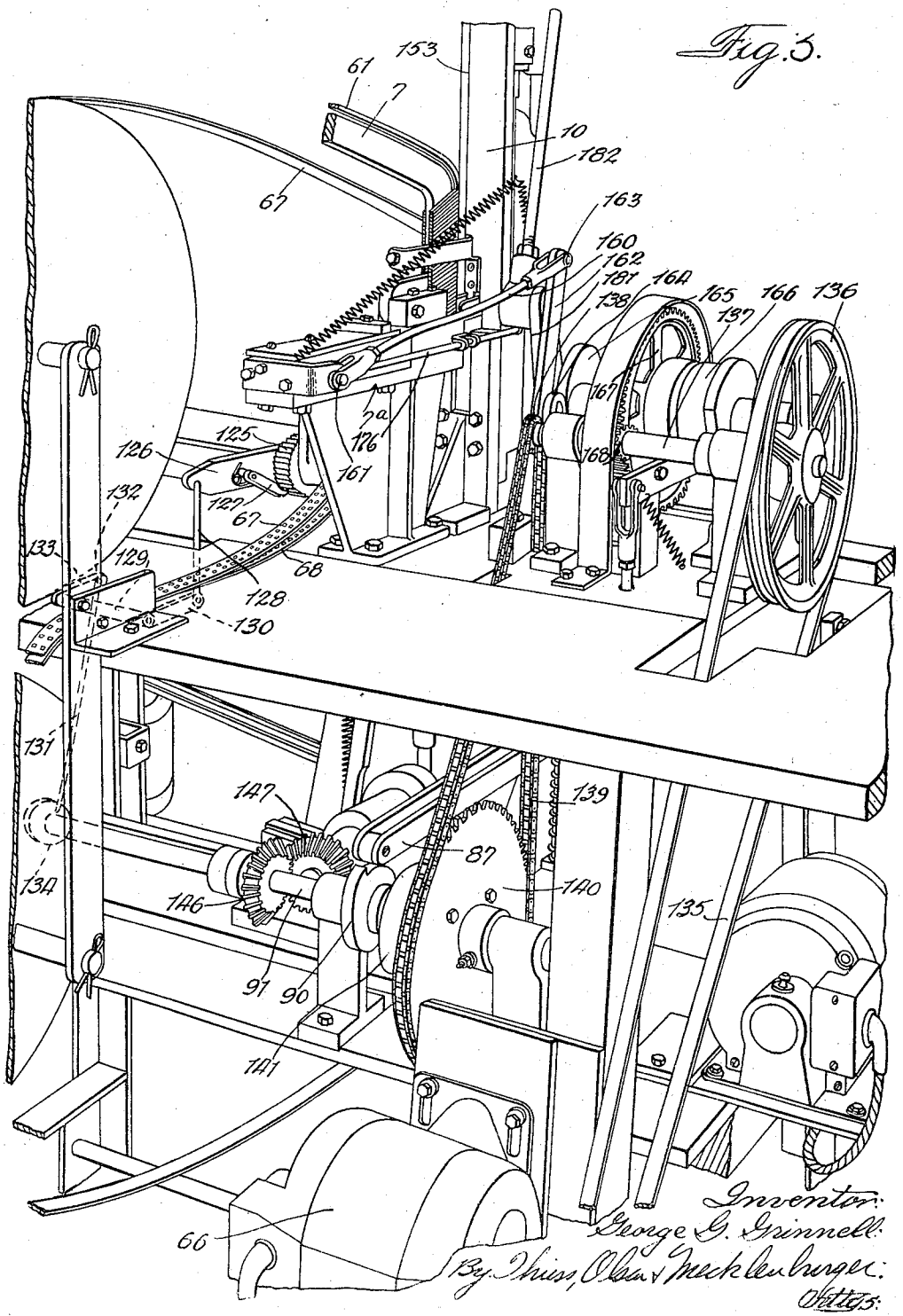
SHEET BINDER

Original Filed Jan. 3, 1941 5 Sheets-Sheet 3

Fig. 5.



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SHEET BINDER

Original Filed Jan. 3, 1941 5 Sheets-Sheet 4

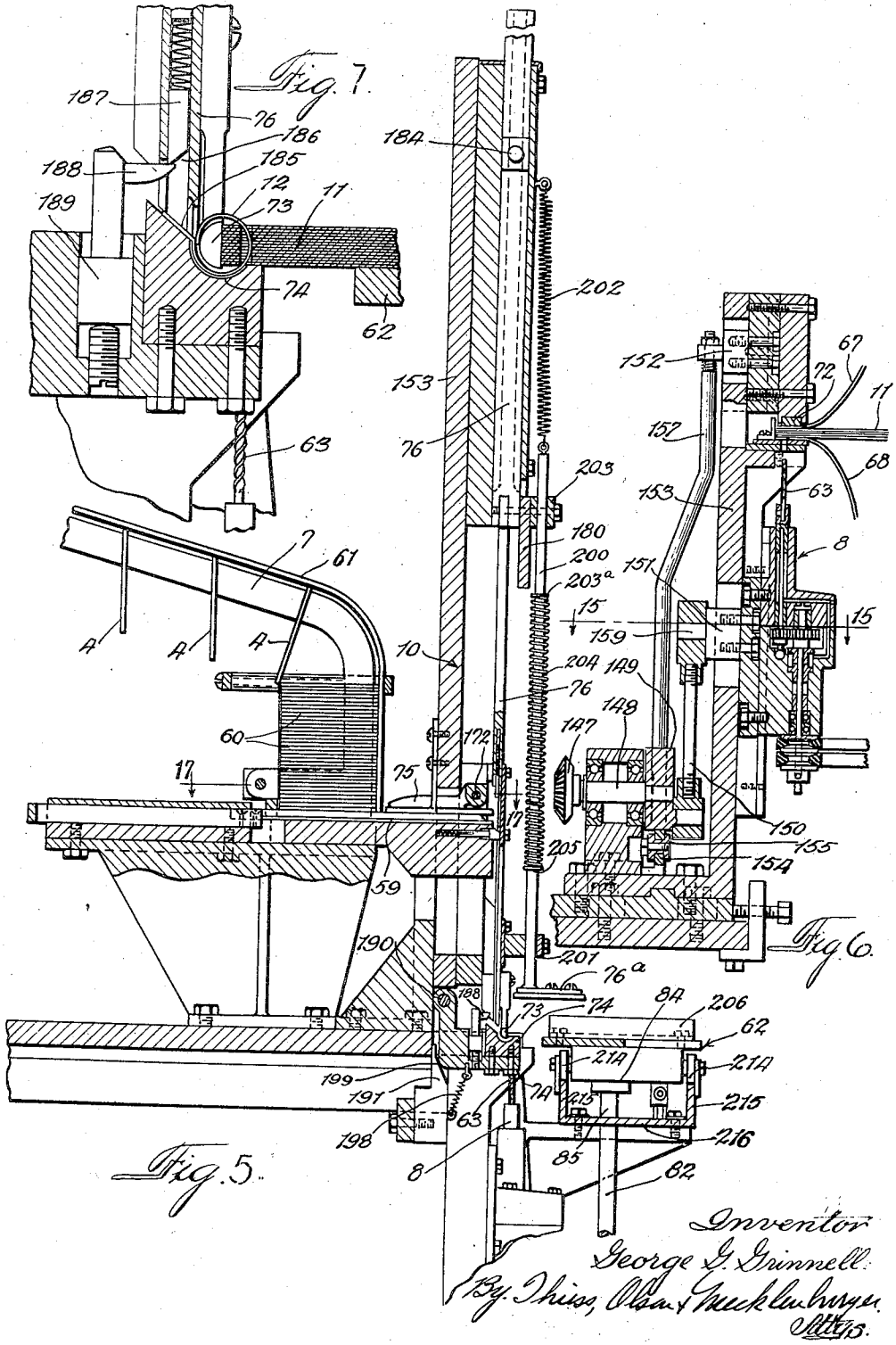

Fig. 7.

Fig. 6.

Fig. 5.

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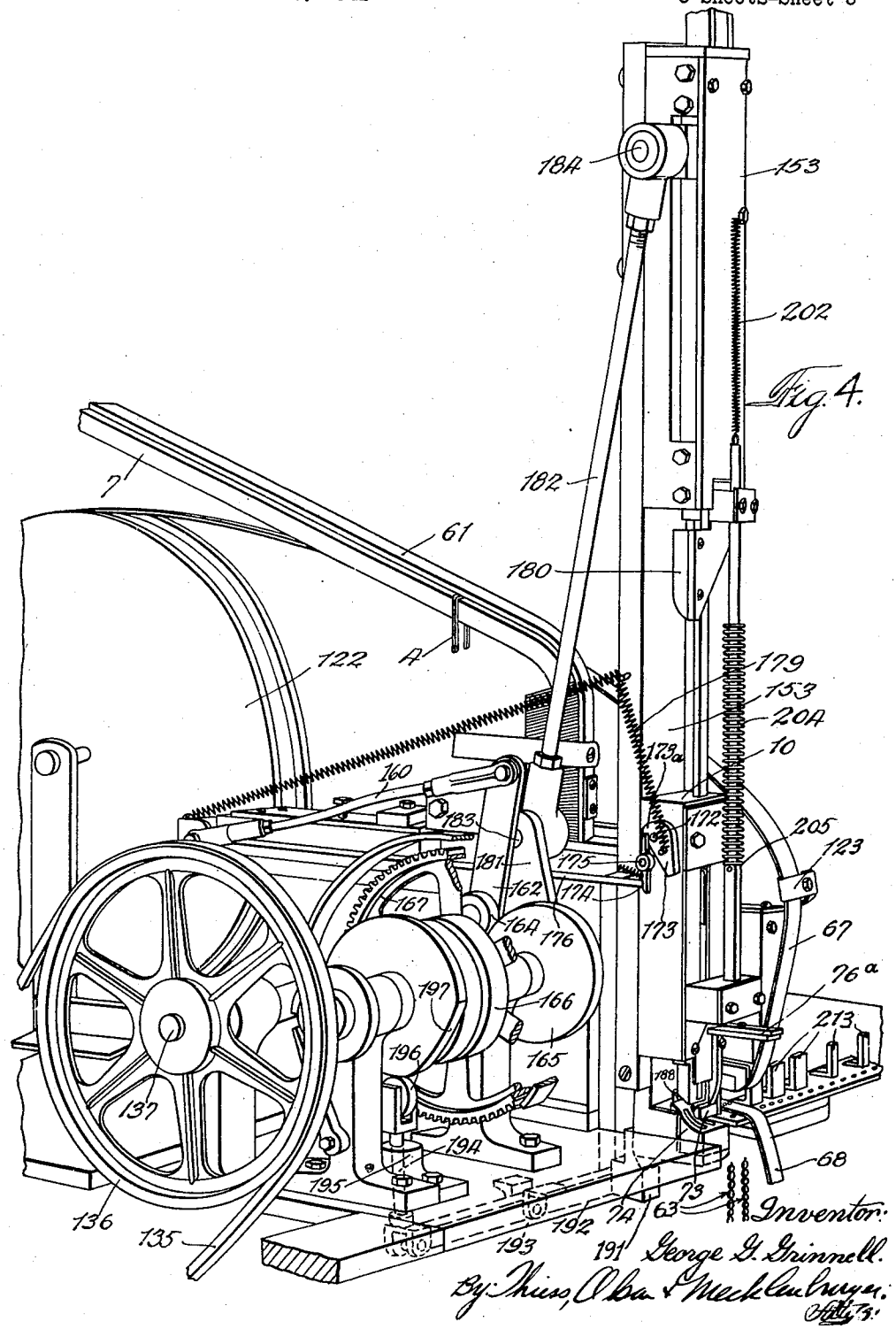
SHEET BINDER

Original Filed Jan. 3, 1941 5 Sheets-Sheet 5



United States Patent Office 2,850,927 Patented Sept. 9, 1958

2,850,927

SHEET BINDER

George G. Grinnell, Boston, Mass.

Continuation of application Serial No. 175,456, July 22, 1950, which is a continuation of application Serial No. 596,883, May 31, 1945, which is a division of application Serial No. 373,021, January 3, 1941, now Patent No. 2,377,340, dated June 5, 1945. This application February 11, 1954, Serial No. 409,608

3 Claims. (Cl. 77—63)

My invention relates to sheet binders.

This application is a continuation of my copending application Serial No. 175,456, filed July 22, 1950, now abandoned, which is a continuation of my application Serial No. 596,883, filed May 31, 1945, now abandoned, which is a division of my application Serial No. 373,021, filed January 3, 1941 (now Patent No. 2,377,340).

One of the objects of my invention is to provide apparatus for drilling superimposed sheets without burring the outermost sheets.

Further objects and advantages of the invention will be apparents from the description and claims.

In the drawings, in which my invention is illustrated,

Fig. 1 is a perspective view showing the drilling and inserting apparatus;

Fig. 2 is a front elevational perspective view of the drilling and inserting apparatus;

Fig. 3 is a perspective view showing the tape feeding and fastener segregating mechanism;

Fig. 4 is a perspective view showing the segregating mechanism and inserting mechanism;

Fig. 5 is a vertical transverse section showing the segregating mechanism, inserting mechanism, and the drilling mechanism;

Fig. 6 is a vertical section showing the drilling mechanism;

Fig. 7 is an enlarged transverse vertical section showing the inserter, forming anvil, and forming die;

Fig. 8 is a horizontal sectional view on the line 17—17 of Fig. 5, and

Fig. 9 is a bottom view of the tablet carriage.

Referring now to the drawing, the tablet drilling and fastener-inserting mechanism provided comprises broadly a horizontally movable carriage 62 (Figs. 1, 2, 5, 7 and 9) on which the pad of sheets 11 to be fastened together are secured in position, a treadle-controlled step-by-step feed for this carriage to shift the tablet edgewise after each drilling and fastener-inserting operation to bring the tablet in position for another drilling and fastener-inserting operation, a treadle-controlled return mechanism for returning the tablet carriage to initial position after all of the fasteners have been inserted, a pair of rotary drills 63 (Figs. 1, 4, 6 and 7) for drilling a pair of holes in the tablet pad, properly spaced to receive the legs of a fastener element and a mechanism 10 for aligning the fasteners and inserting them "feet first" through the pair of previously-drilled holes in the tablet pad 11.

Three motors are provided, one 64 (Fig. 2) for effecting the rotary movement of the pair of drills 63, another 65 for effecting the return travel of the tablet carriage 62 and another 66 (Fig. 3) for effecting the other operations including the axial feed movement of the drills 63, the escapement mechanism for the step-by-step feed of the tablet carriage, the insertion of a U-shaped fastener element 4 (see Fig. 3), and the feed for the two guard tapes 67 and 68 which are fed, respectively, above and below the tablet 11 as it is being drilled, to prevent the mutilation of the outside sheets of the tablet by the

point of the drill. The operation of the pedal 69 (Fig. 2) causes the axial movement of the drill head 8, the actuation of the pedal 70 causes the insertion of a fastener element, and the operation of the pedal 71 causes the return of the tablet carriage.

In operation it is customary, first, to depress the pedal 69 to drill a pair of holes in the tablet pad 11 without causing the operation of the fastener inserter, then to shift the foot slightly to the left, as viewed in Fig. 2, so as to rest on both pedals 69 and 70, and depress both pedals to cause the insertion of a fastener 4 into the two holes and to cause the drilling of two holes spaced from the first two holes for the subsequent insertion of another fastener. As explained hereinfater, each time the pedal 69 is depressed, it will cause and up-and-down movement of the drills 63 and a one-step feeding movement of the carriage 62.

For the insertion of the final fastener element of the tablet sheets, the operator may either depress both pedals 69 and 70, causing the rise of the drill head and the insertion of a fastener in the last pair of holes in the tablet (the tablet having passed beyond the position in which it will be in the path of the drills), or the operator may simply depress the inserted pedal 70 causing the insertion of a fastener without any axial movement of the drill head. When the last fastener has been insterted in the tablet, the operator depresses the carriage-return pedal, causing the carriage to return to its initial position.

After passing through the tablet, the point of the drill enters a wooden block 72 (Fig. 5) which is automatically pressed against the upper guard tape during the drilling operation. The first drilling movement forms a guide recess or pocket in the under face of the wooden block 72 which serves to center the point of the drill as it passes through the tablet.

The mechanism for feeding the U-shaped fasteners from the vertical stack 60 to the forming anvil 73 and forming die 74 (Figs. 4, 5, 7 and 8) comprises the selecting and segregating plunger 59 operating in a horizontal plane underneath the stack of fasteners, and a pair of spaced parallel aligning rock arms 75 (Fig. 5) for moving the segregated fastener 4 from a horizontal position to a vertical position in alignment with the inserter plunger 76 which reciprocates up and down and, on its downward stroke, engages the cross bar 51 of the U-shaped fastener 4 and forces the fastener downwardly to cause its lower ends to bend around inside of the arcuate guide channels in the die 74 and around the semi-cylindrical surface of the anvil 73, as shown in Figs. 2, 4, 5, and 7.

A suitable spring-pressed presser foot 76*a* is provided for holding the tablet pad 11 down on the carriage 62 during the inserting operation.

The drive for the step-by-step carriage feed comprises a cord or cable 77 (Fig. 2) having one end 78 secured to the tablet carriage 62 and the other end 78*a* secured to the frame, a pulley 79 over which this cable 77 passes, and a weight 80 to the upper end of which a pulley 81 is secured, about which the cable passes. The step-by-step release or escapement for the carriage travel (Figs. 1, 2 and 5) comprises a reciprocating stop slide 82, the upper end 83 of which cooperates with stop pins 84 inserted in spaced openings 85 on the rack bar 92 secured to the carriage, a lever 87 pivotally mounted at 88 (Figs. 1 and 3) and having one end pivotally secured at 89 to the stop slide 82, and a cam 90 mounted on a clutch-controlled motor driven shaft 91 (Fig. 3). Each time the shaft 91 makes one revolution, the cam 90 will cause the lever 87 to rock up and down and will cause the withdrawal and return of the stop pin 83 on the slide 82 with respect to the stop pins 84 on the carriage rack 92. The movement of this stop slide 82 is so rapid that it

will release one stop pin **84** on the carriage and catch the next stop on the carriage before the weight **80** has time enough to pull the carriage stop past the stop slide.

For returning the carriage to initial position after it has completed its step-by-step feeding movement to the left, as viewed in Fig. 2, an endless cable **93** is provided having a lost-motion connection with the tablet carriage **62** and passing over the end pulleys **94** and **95**. The cable **93** may be brought into driven relationship with respect to the drive pulley **96** by means of cable tightener pulleys **97** and **98** mounted on the pedal-controlled rock lever **99**. The drive pulley **96** is driven from the motor **65** by means of a cable **100** passing over the drive pulley **101** on the motor and over a driven pulley **102** mounted on the shaft **103** to which the drive pulley **96** is secured.

When the carriage return pedal is depressed, it pulls the carriage stop **83** out of the way of the stop abutment **84** of the carriage and rocks the rock lever **99** about its pivot **104** to move the cable tightener pulleys **97** and **98** upwardly to press the cable **93** firmly against the drive pulley **96**. The carriage return pedal **71** is secured to the stop slide **82** by means of a link **105**, a crosshead **106** (Fig. 1) secured to the link **105**, and a coil compression spring **107** engaged by the crosshead **106** and bearing on the head **108** of a slide rod **109** secured to the slide **82**. The crosshead **106** slides on the rod **109** until the spring **107** is compressed sufficiently to press the slide **82** downward. The rock lever **99** is secured to the crosshead **106** by means of a rod **110** pivotally connected with the lever **99** at **111**. A spring **112** is provided which tends to hold the stop slide **82** in raised position and to hold the cable tightener pulleys **97** and **98** away from the cable **93**.

The cam **90** can cause withdrawal and return of the stop **83** without causing movement of the cable tightening lever **99**, since the rod **109** is slidable in the crosshead **106**. When the pedal **71** is depressed it first actuates the cable tightening lever **99** and then, when the downward pressure of the spring **107** overcomes the upward pressure of the spring **112** on the stop slide **82**, the stop **83** will be withdrawn to enable the drive pulley **96** to return the tablet carriage **62** to starting position.

The right-hand movement of the carriage **62**, as viewed in Figs. 1 and 2, under the driving action of the drive pulley **96**, is limited by means of a button **113** on the carriage-return cable which engages a stop **114** on the frame. A connection is provided between the carriage return cable **93** and the tablet carriage by means of a button **115** secured to the cable and engaging a forked abutment **116** on the carriage, which straddles the cable so that the button **115** on the cable can engage the fork. Because of the forked connection **116** between the cable and carriage, the carriage may be readily disconnected and removed from the cable when desired.

The mechanism for withdrawing the tapes **67** and **68** from the storage spools **122**, guiding them to positions, respectively, above and below the tablet being bound (Figs. 1, 2, 3, 4, and 6) comprises the guides **123** for directing the tapes into position with respect to the tablet, and a pair of step-by-step feed rolls **124** between which both tapes pass after they have moved past the tablet. The mechanism for giving the step-by-step feed to these two feed rolls comprises a ratchet wheel **125** (Figs. 1 and 3) on the shaft of one of the feed rolls **124**, a rock lever **126** coaxial with this ratchet wheel, a pawl **127** mounted on this lever actuating the ratchet wheel **125**, a link **128** pivotally connected with the rock lever, a bell crank pivotally mounted at **129** and having one arm **130** pivotally connected with the link **128**, a connecting rod **131** pivotally connected at **132** with the other arm **133** of the bell crank, and a crank **134** (Fig. 2) to which the other end of the connecting rod is pivotally secured, mounted on the shaft **91**. With this construction, it will be seen that every time the shaft **91** is given a single revolution the pawl carrying lever **126** will be given a movement back and forth to effect a single feed step of the tape feed rolls **124**. The transmission is so timed that the step feed of the tape will be made at a time when the drills **63** are withdrawn from the tablet so as not to interfere with the tape feeding movement.

As previously indicated, the purpose of the guard tapes **67** and **68** is to prevent the mutilation of the outside sheets of the tablet by the point of the drill. The feed for these tapes is comparatively slow. After passing through the feed rolls **124**, the perforated tapes pass downwardly and may be torn off by the operator from time to time and thrown away or otherwise disposed of.

The drive for the shaft **91** is from the motor **66** through the belt **135** (Figs. 2, 3 and 4) running over the pulley on the motor shaft, a pulley **136** over which the belt runs, a shaft **137** on which this pulley is mounted, a sprocket wheel **138** mounted on this shaft, a sprocket chain **139** running over this sprocket wheel **138** and a large sprocket wheel **140** connectible and disconnectible with respect to the shaft **91** by means of a clutch **141** (Fig. 3) controlled by the pedal **69** in such a manner that when the clutch is released the shaft **91** will stop in a fixed definite position.

The transmission from the clutch pedal **69** (Fig. 2) to the clutch **141** comprises a rock arm **142** mounted on the rock shaft **143** to which the pedal **69** is secured, a link **144** pivotally connected at one end to this rock arm, and a clutch controlling member **145** pivotally secured to the upper end of this link. This clutch pedal **69** which controls the tape feeding operation also controls the axial movement of the drills **63** in effecting the drilling operation. The transmission, by which this axial feed movement of the drill head is effected, comprises a bevel gear **146** mounted on the shaft **91**, a bevel gear **147** (Figs. 1, 3 and 6) meshing with the first bevel gear **146**, a shaft **148** on which this second bevel gear **147** is mounted, a combination cam and crank disc **149** secured to this shaft **148**, and a connecting rod **150** pivotally secured to the crank shaft at one end and pivotally secured to the vertically slidable drill head **151** at the other end. With this construction it will be seen that every time the tape is given a feed step the drill head **151** is caused to be moved up and down in proper timed relation.

From the preceding description, it will be seen that each time the pedal **69** is depressed the shaft **91** will be given one complete revolution, which causes the up-and-down movement of the drill head **151**, the one-step feeding movement of the tape, and the one-step feeding movement of the tablet carriage **62**, all in proper timed relation.

In order to bring the wooden block **72** down on the tablet at the proper time in the drilling operation, it is mounted on a slide **152** vertically movable in the standard **153** and caused to move up and down by means of the cam formed on the edge of the crank disc **149** which engages a follower roller **154** on the lever **155** pivotally mounted at **156** and connected with the vertically movable slide **152** by means of a connecting rod **157** pivotally secured to the lever at **158** and pivotally secured to the sliding block at **159**.

In use, when the machine is supplied with the material to be operated on, including a flat wire and the guard tapes **67** and **68**, and the machine is put in operation, fastener forming mechanism operates continuously to supply the U-shaped fasteners **4** to the guide **7** from which guide they are removed, one at a time, by a segregating and feeding mechanism. The timing of these successive operations of the feeding mechanism is controlled by the operator. As previously indicated, the operator places a pad or tablet in position on the carriage **62** and allows the carriage to move the left as viewed in Fig. 10, until a stop pin **84** engages the stop **82** to bring the tablet into proper position for drilling and inserting the fastener. The operator then depresses the pedal **69** to drill a pair of

holes in the tablet or pad **11** without causing the operation of the fastener inserter, then shifts the foot slightly to the left, as viewed in Fig. 2, so as to rest on both pedals **69** and **70**, and then depresses both pedals to cause the insertion of a fastener **4** into the two holes and to cause the drilling of two holes spaced from the first two holes for the subsequent insertion of another fastener.

For the insertion of the final fastener element of the tablet sheets, the operator may either depress both pedals **69** and **70**, causing the rise of the drill head and the insertion of a fastener in the last pair of holes in the tablet (the tablet having passed beyond the position in which it will be in the path of the drills), or the operator may simply depress the inserter pedal **70** causing the insertion of a fastener without any axial movement of the drill head. When the last fastener has been inserted in the tablet, the operator depresses the carriage-return pedal, causing the carriage to return to its initial position.

While the word "tablet" has been used in describing the apparatus, it is to be understood that this apparatus may be useful in any situation where it is desired to perforate and bind sheets.

Further modifications will be apparent to those skilled in the art, and it is desired, therefore, that the invention be limited only by the scope of the appended claims.

I claim:

1. Apparatus for drilling a hole through a pad of fibrous sheets comprising a rotary drill, means for rotating said drill and moving it longitudinally, propulsion means for moving said pad step by step transversely with respect to said drill to bring different portions of the pad into drilling positions, and propulsion means for conveying a perforable burr-preventing sheet to a position juxtaposed to an outside sheet of the pad and in the path of the drill between the drill and the pad prior to the drilling of said outside sheet.

2. Apparatus for drilling a hole through a pad of fibrous sheets comprising a rotary drill, means for rotating said drill and moving it longitudinally, step feed means for feeding a perforable burr-preventing sheet to a position juxtaposed to the outside sheet of the pad and in the path of the drill between the drill and pad prior to the drilling of said outside sheet.

3. Apparatus for drilling a hole through a pad of fibrous sheets comprising a rotary drill, means for rotating said drill and moving it longitudinally through said pad thickness, and propulsion means conveying perforable burr-preventing sheets to positions juxtaposed to the outermost sheets of the pads prior to the engagement of said drill with said pad.

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