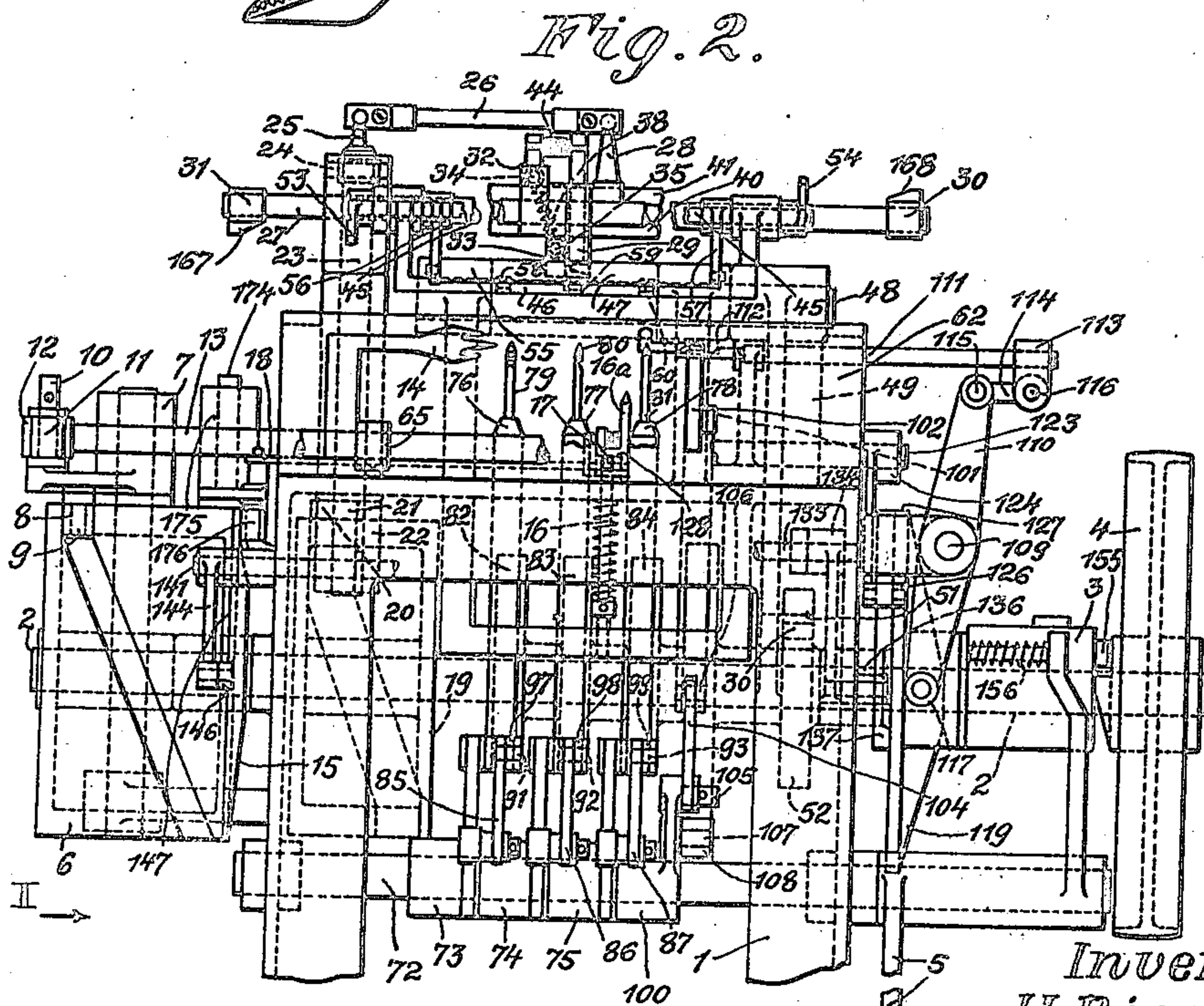
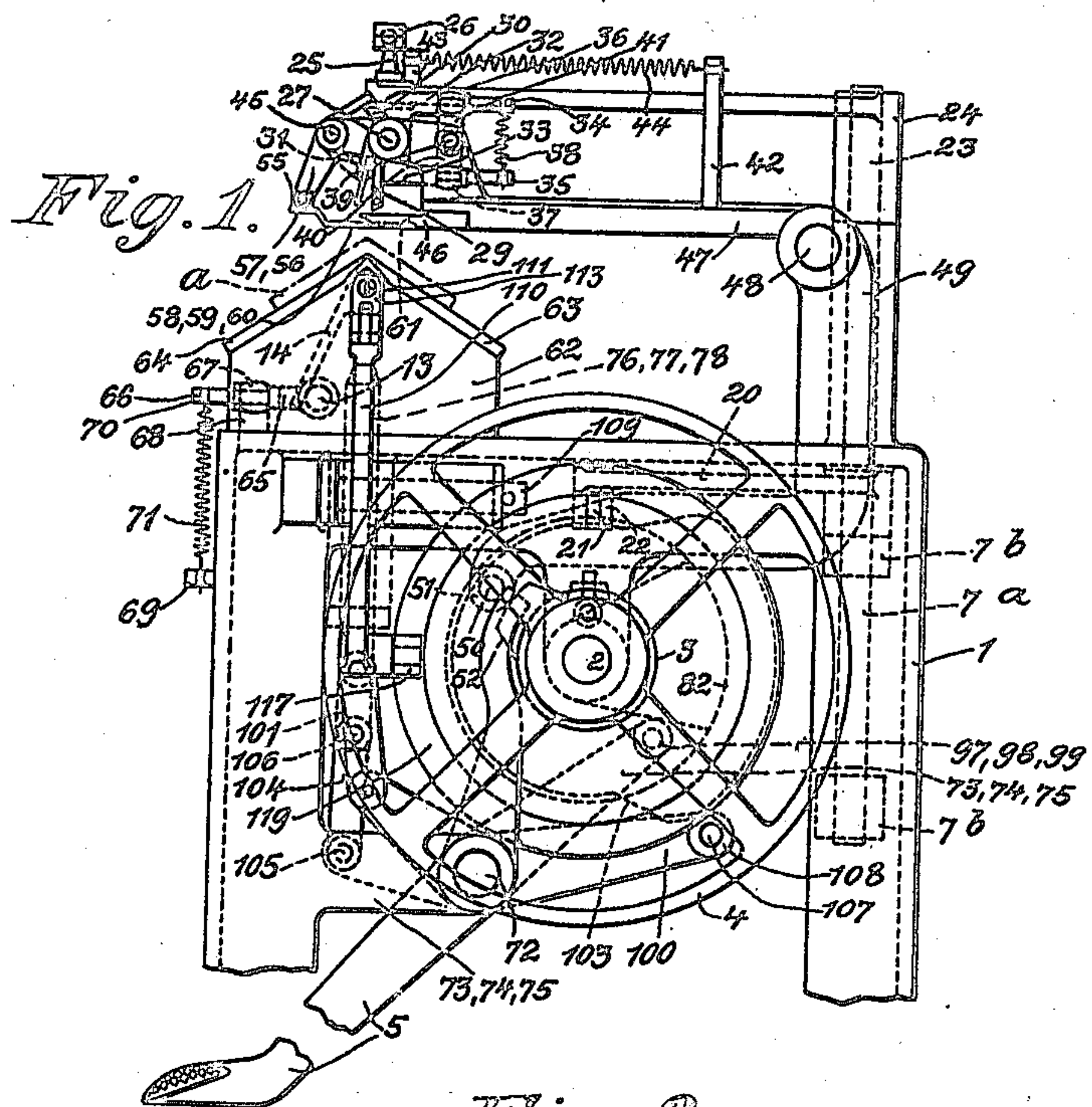


Jan. 2, 1923.

U. BISCHOF.
SHEET STITCHING MACHINE.
FILED AUG. 1, 1919.

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8 SHEETS-SHEET 1



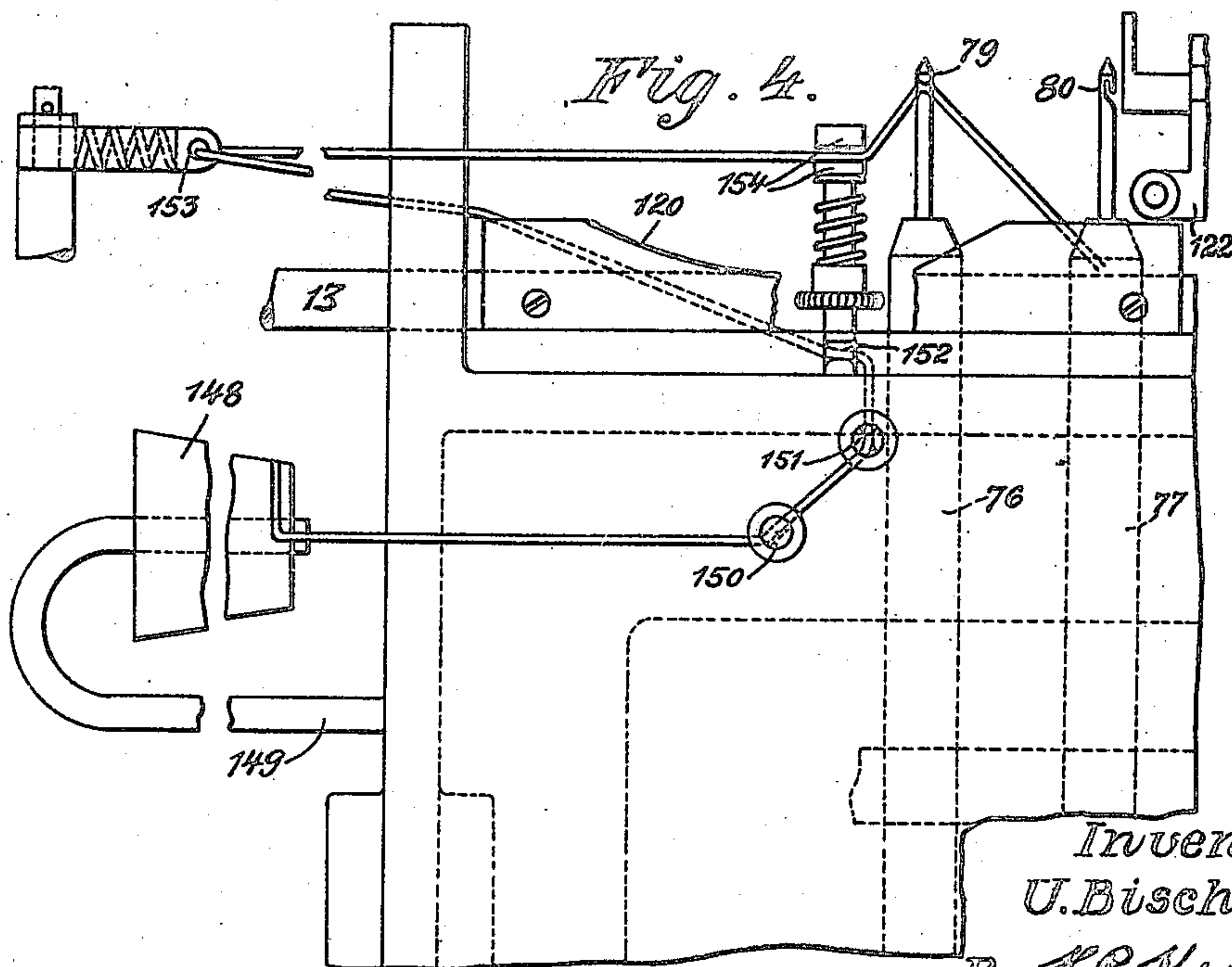
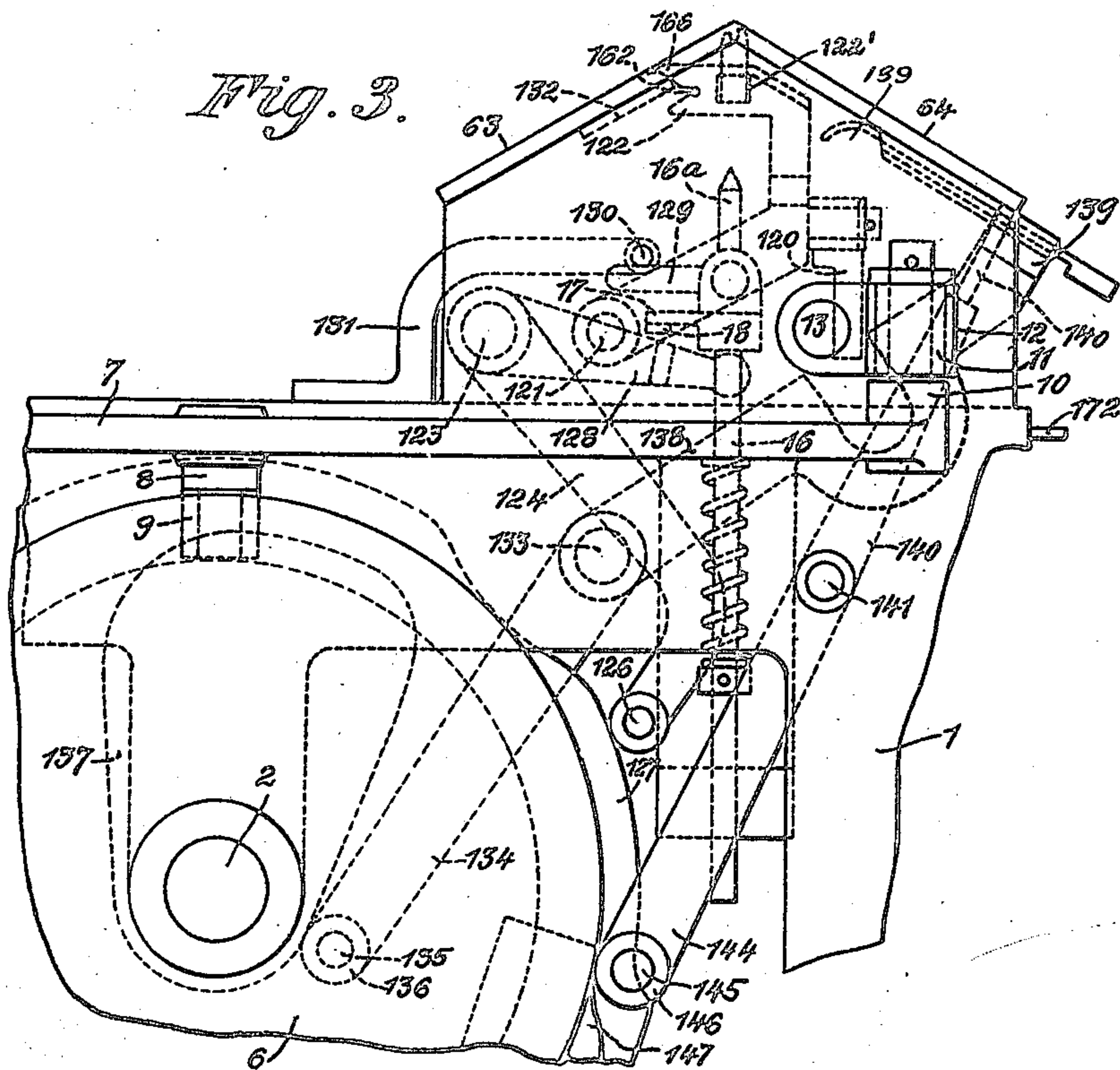
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SHEET STITCHING MACHINE.
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8 SHEETS-SHEET 2



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SHEET STITCHING MACHINE.
FILED AUG. 1, 1919.

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Fig. 5.

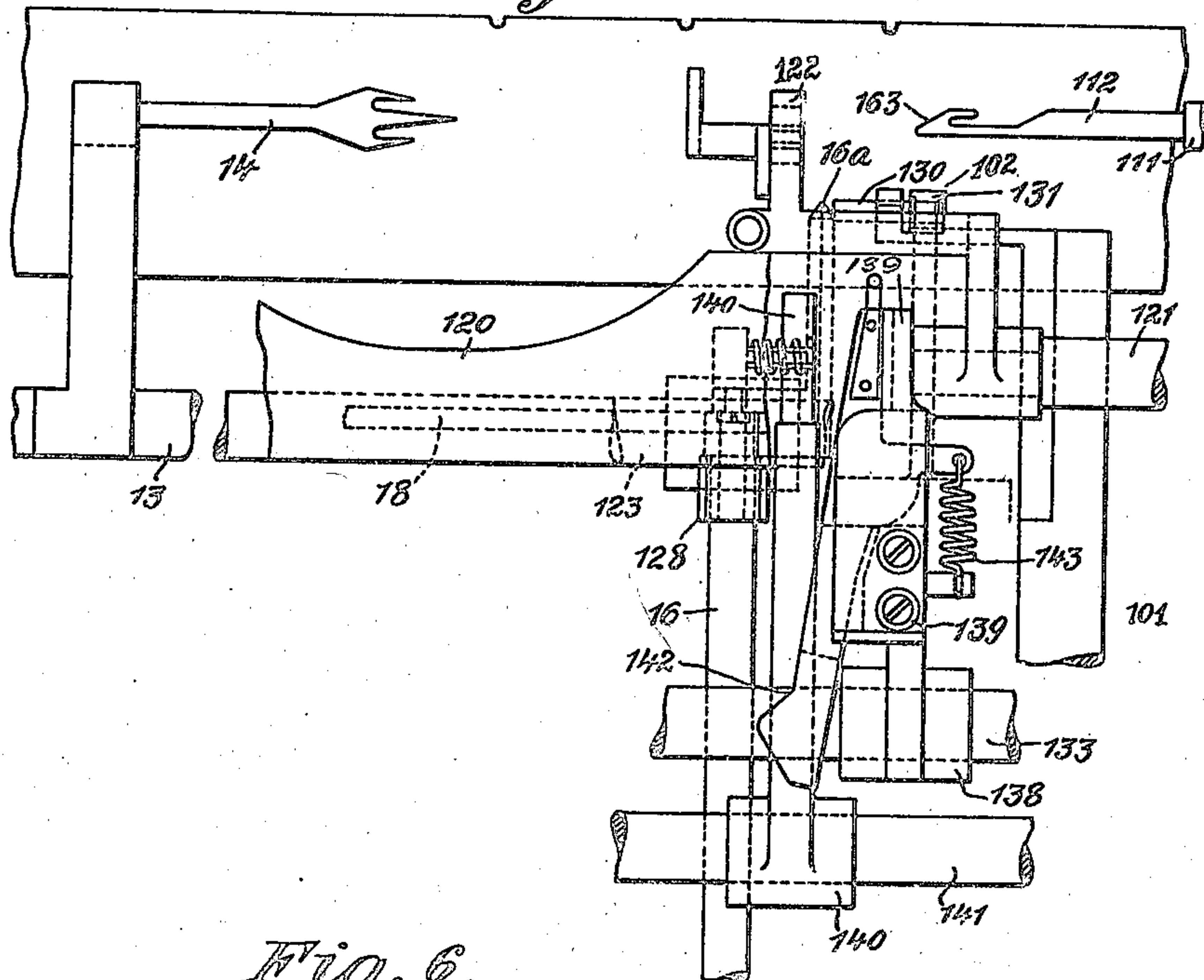


Fig. 6.

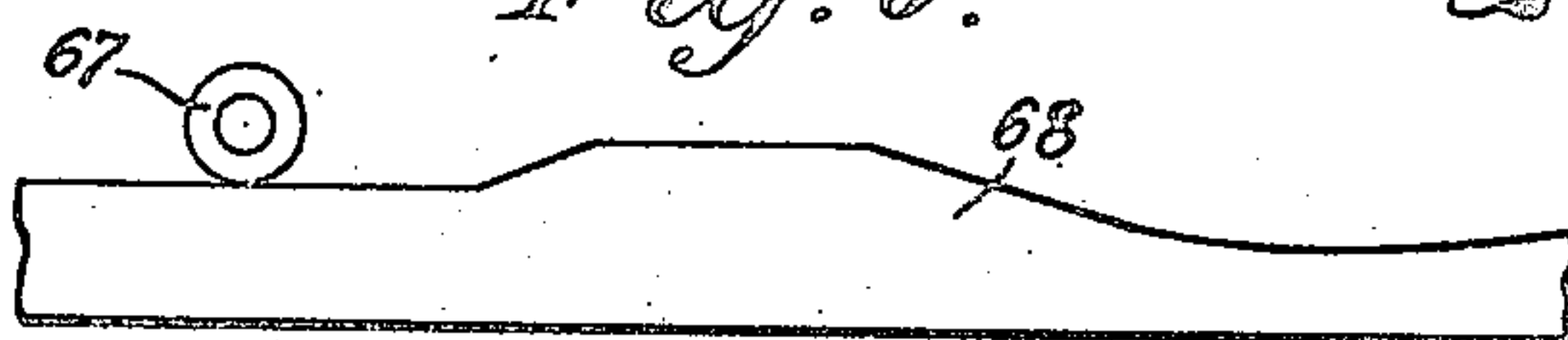


Fig. 7.

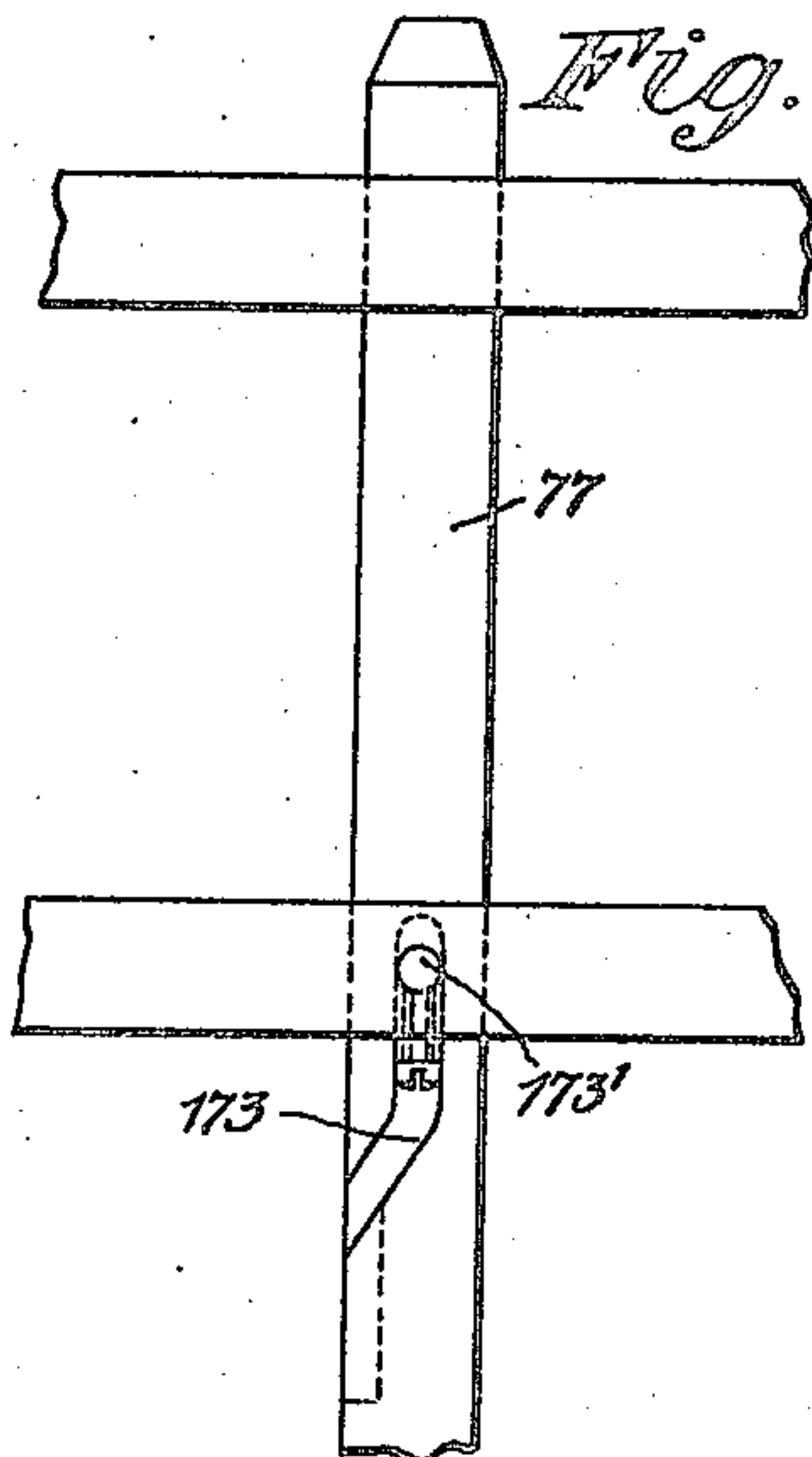
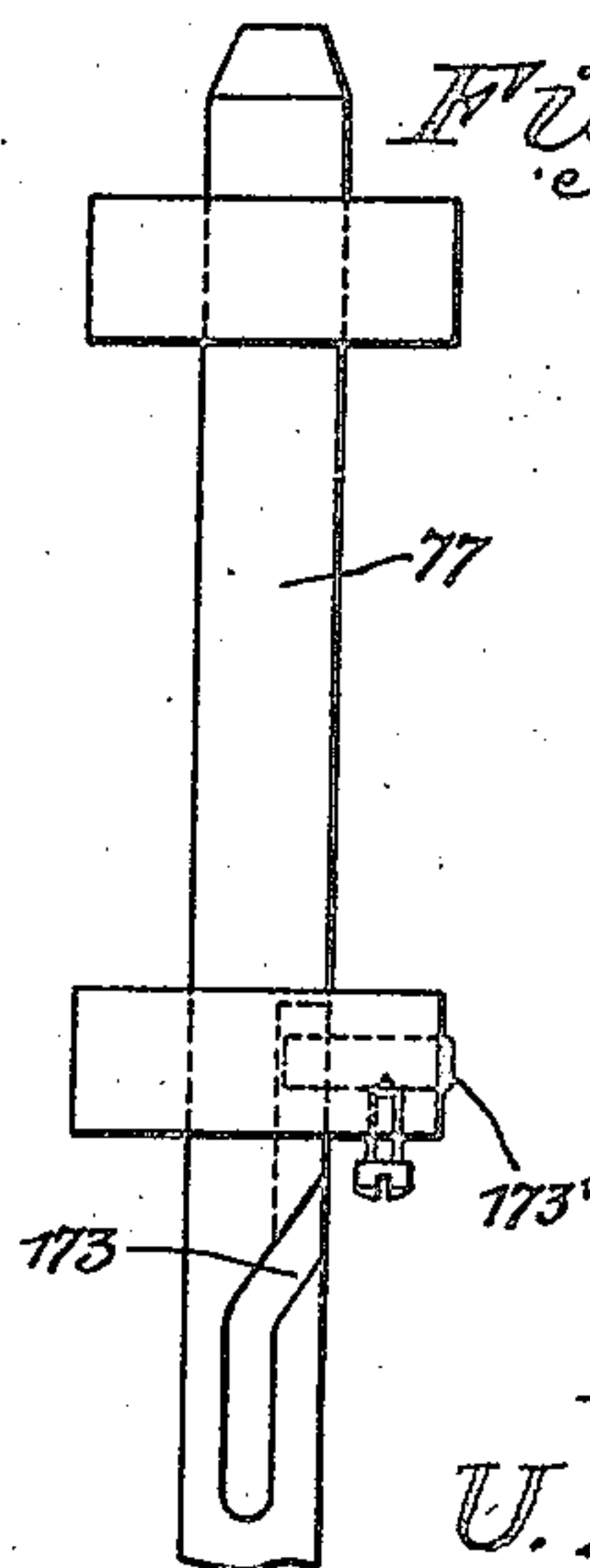


Fig. 8.



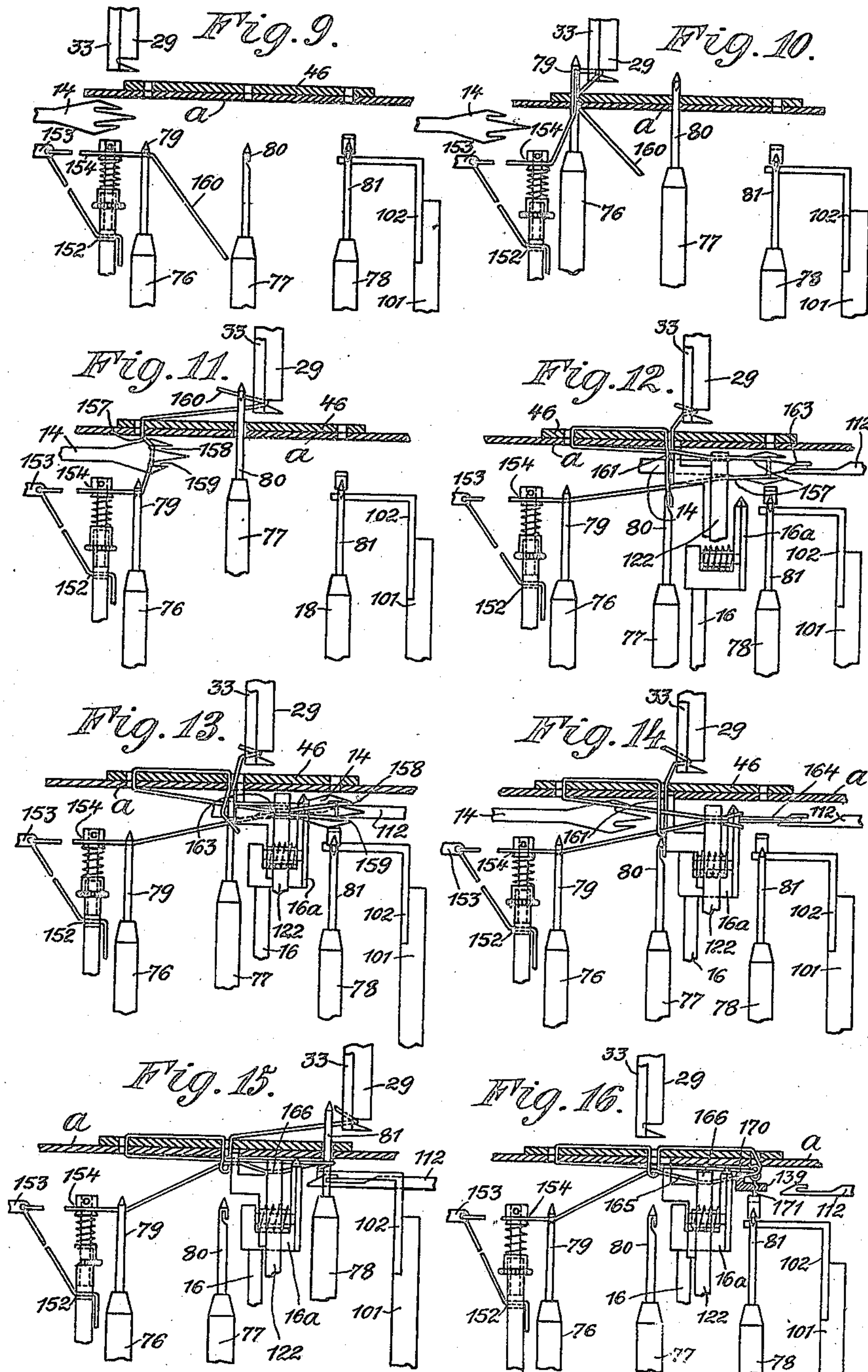
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SHEET STITCHING MACHINE.
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8 SHEETS-SHEET 4



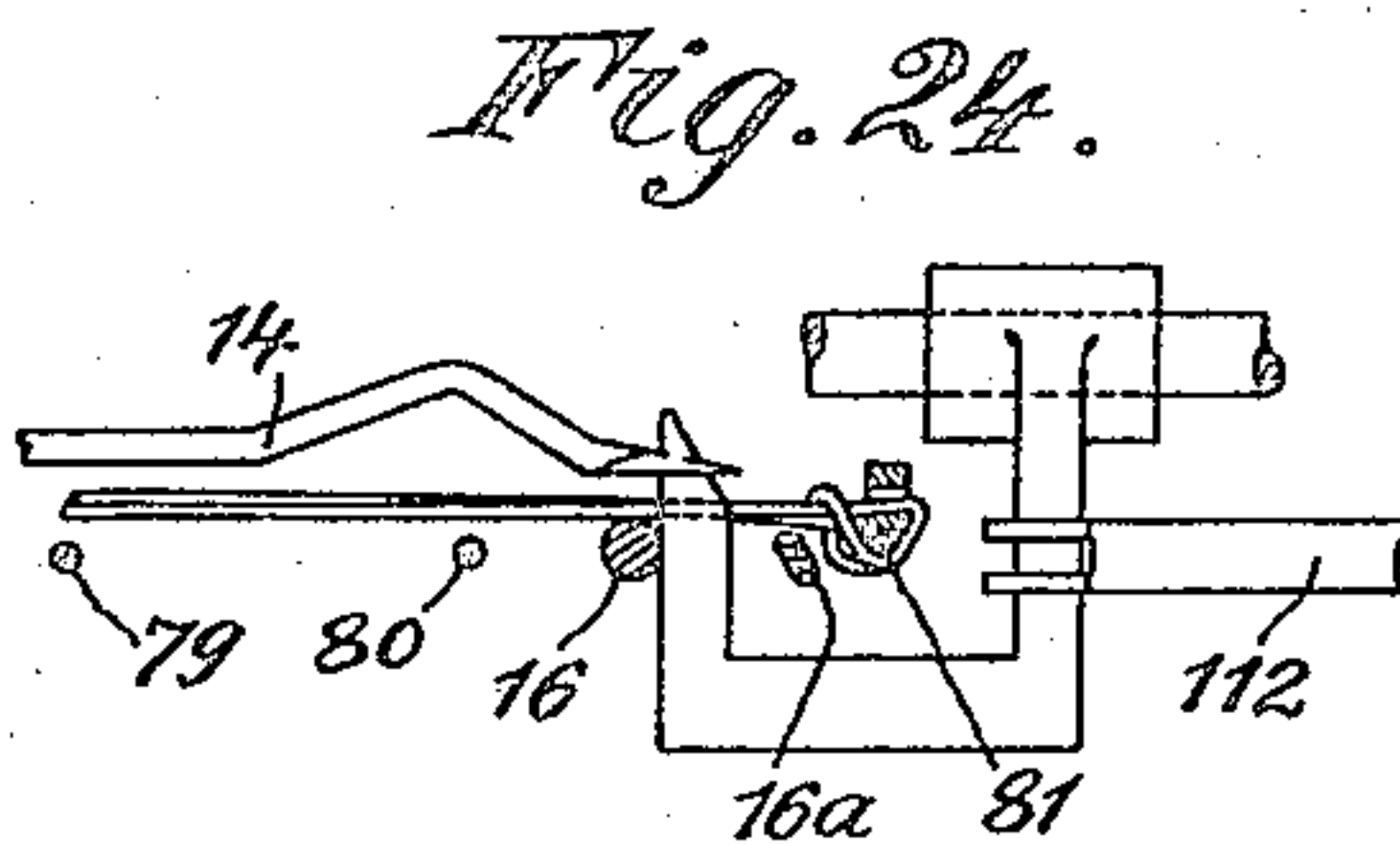
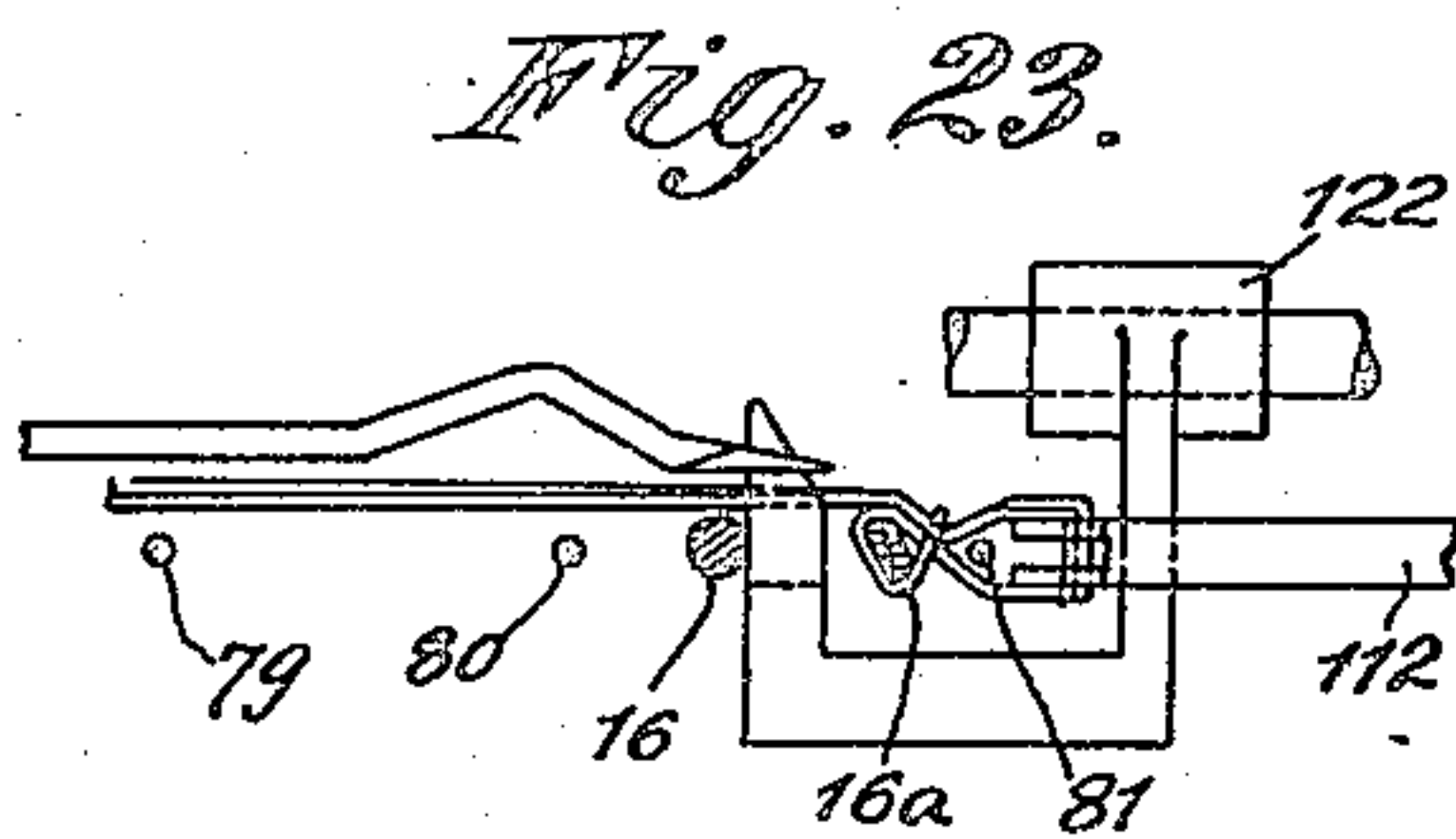
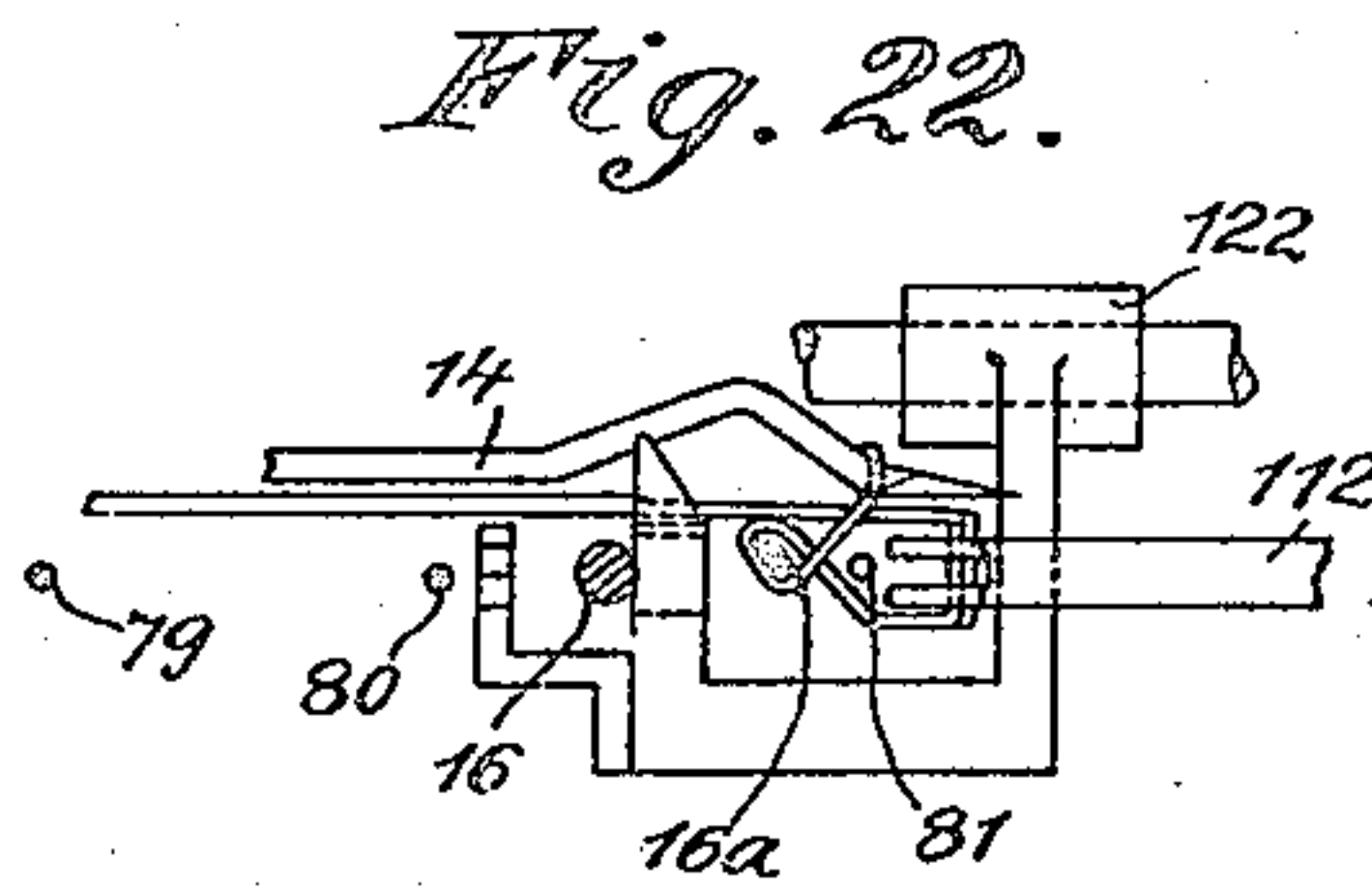
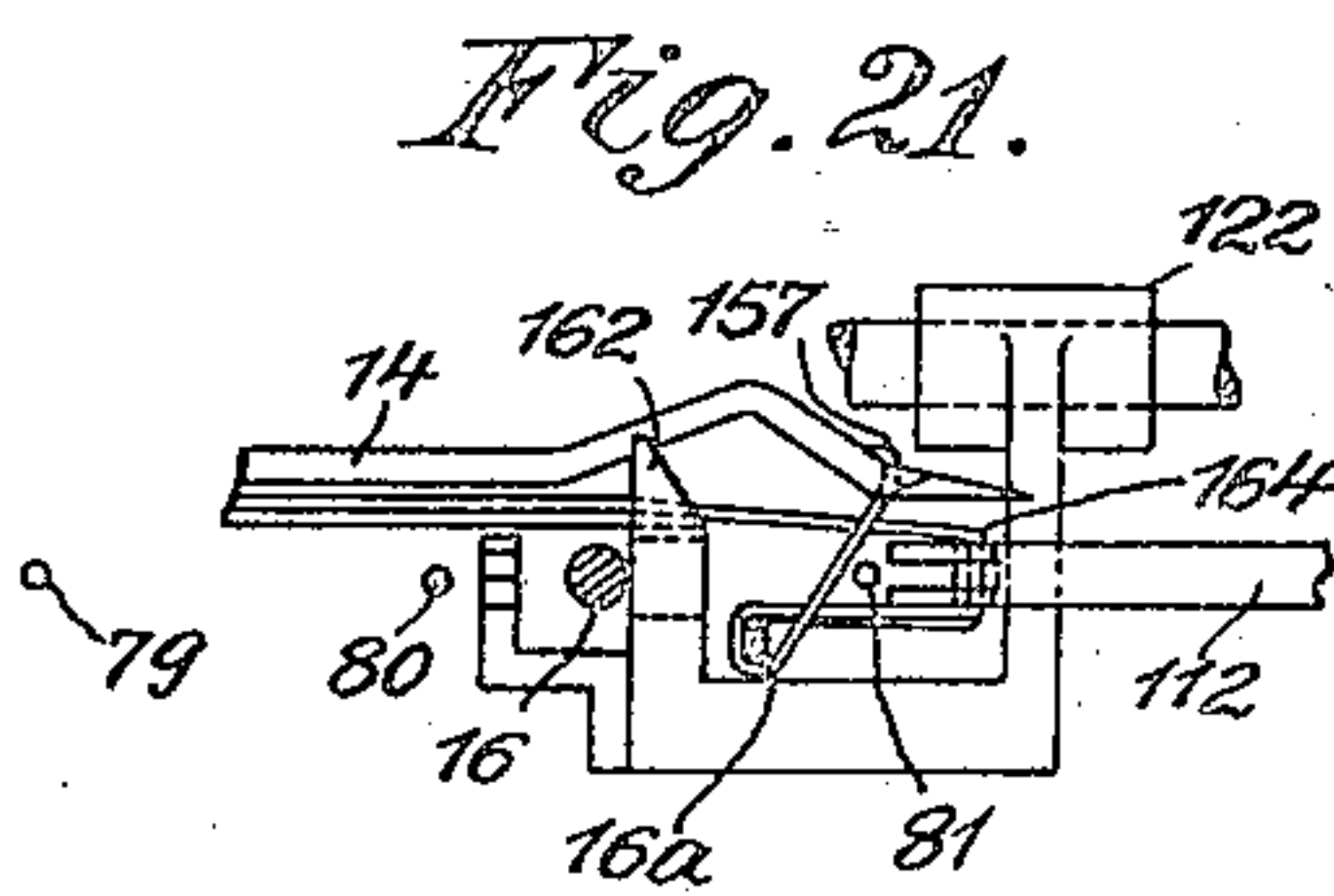
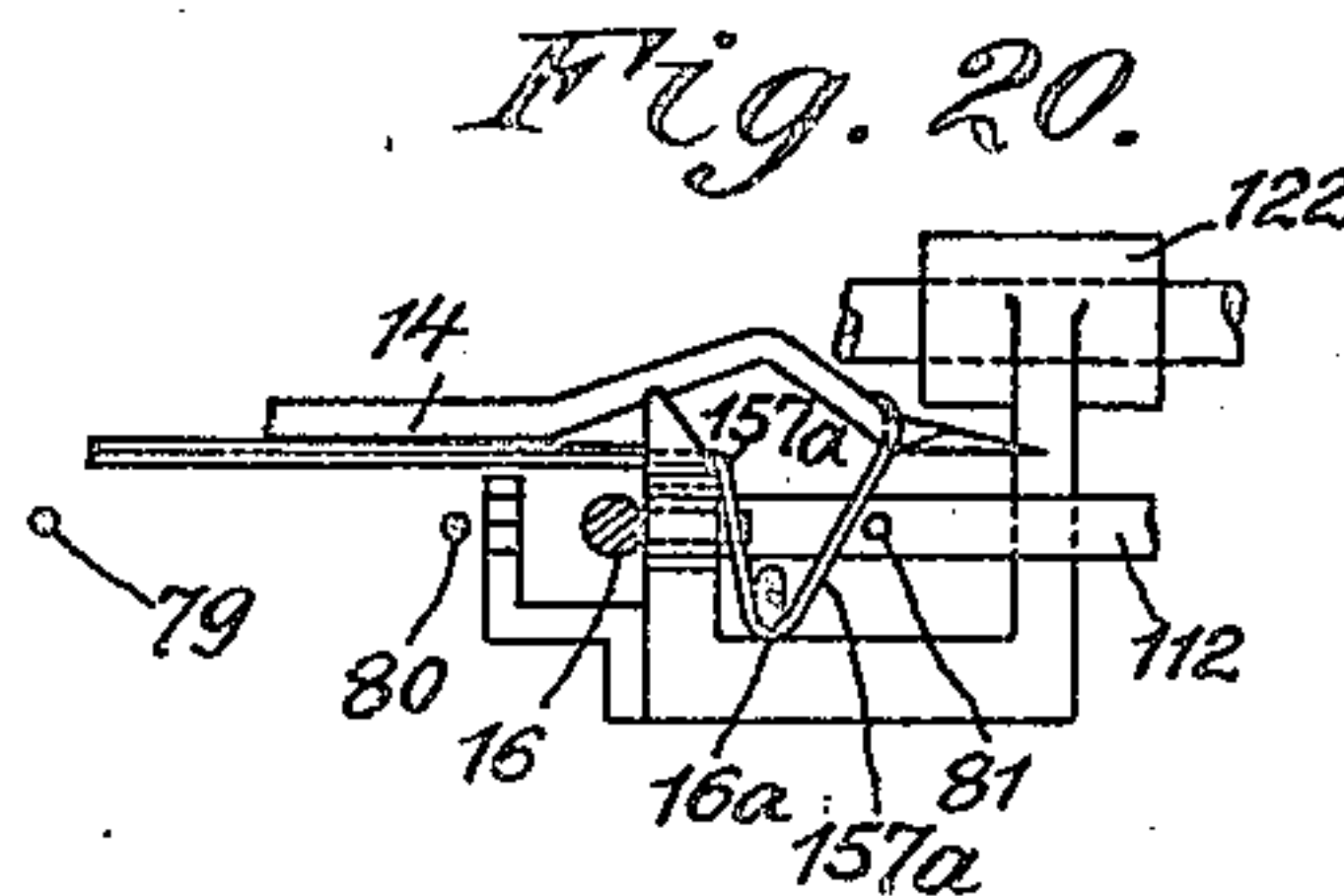
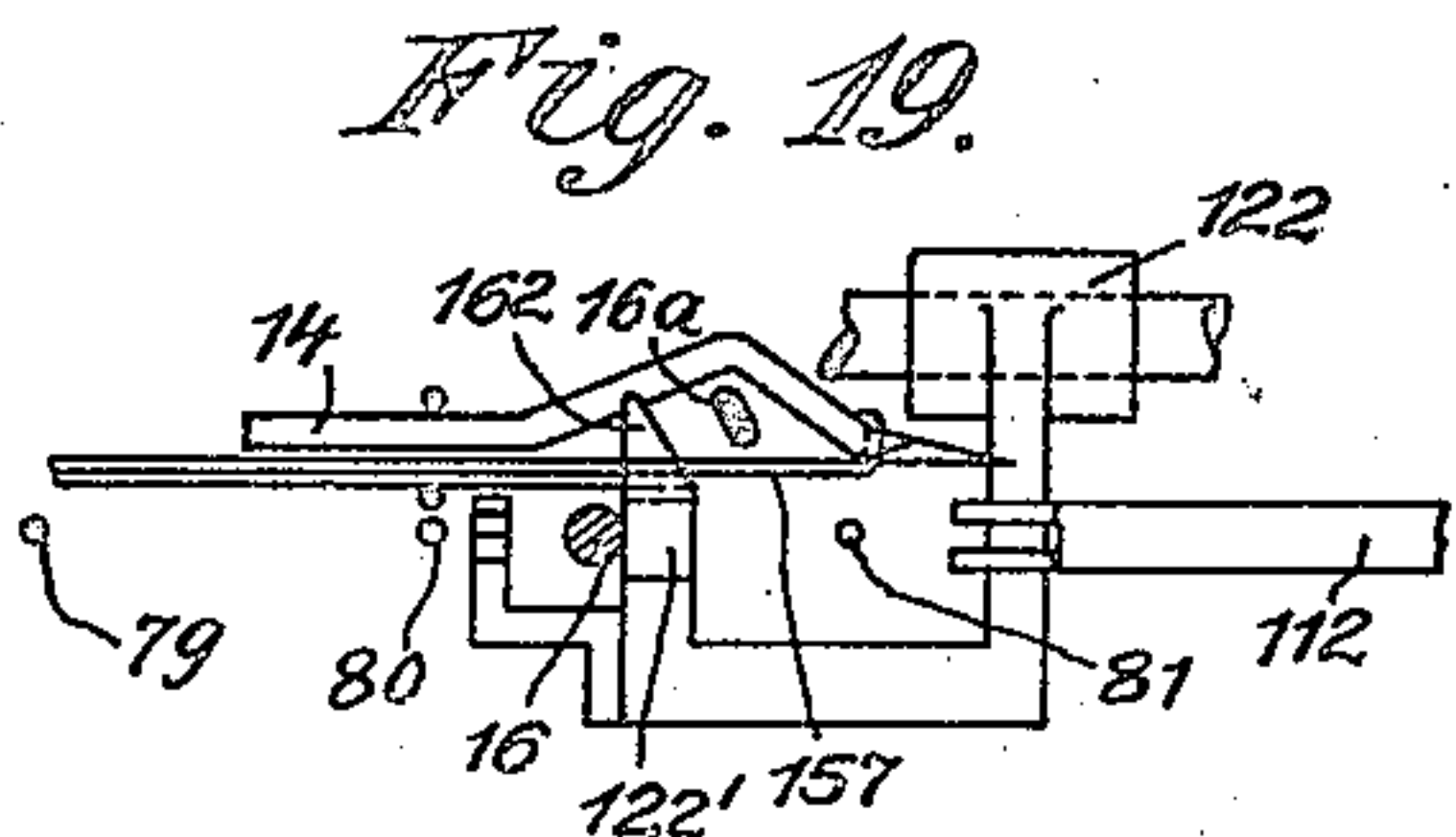
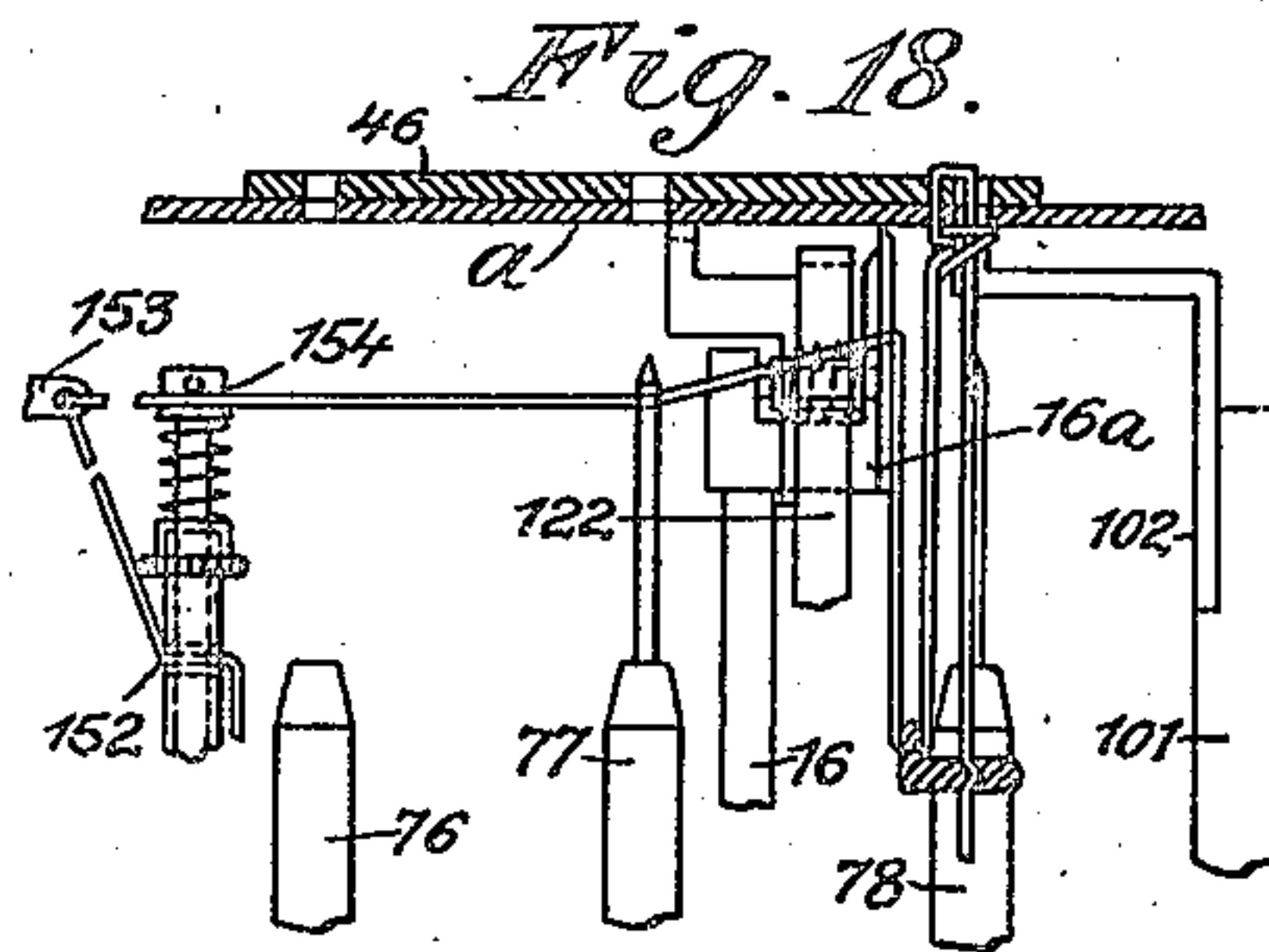
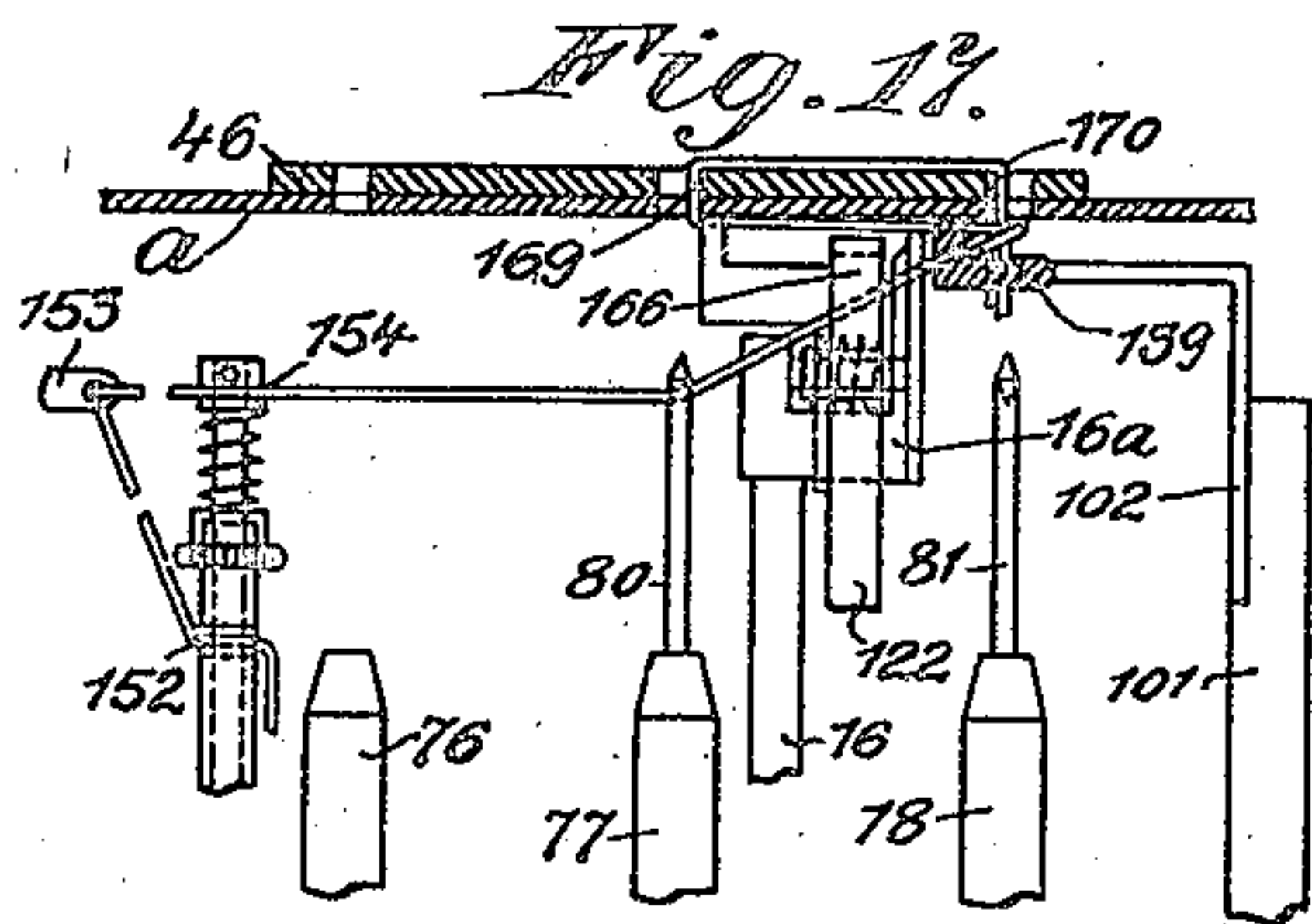
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SHEET STITCHING MACHINE.
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8 SHEETS-SHEET 5



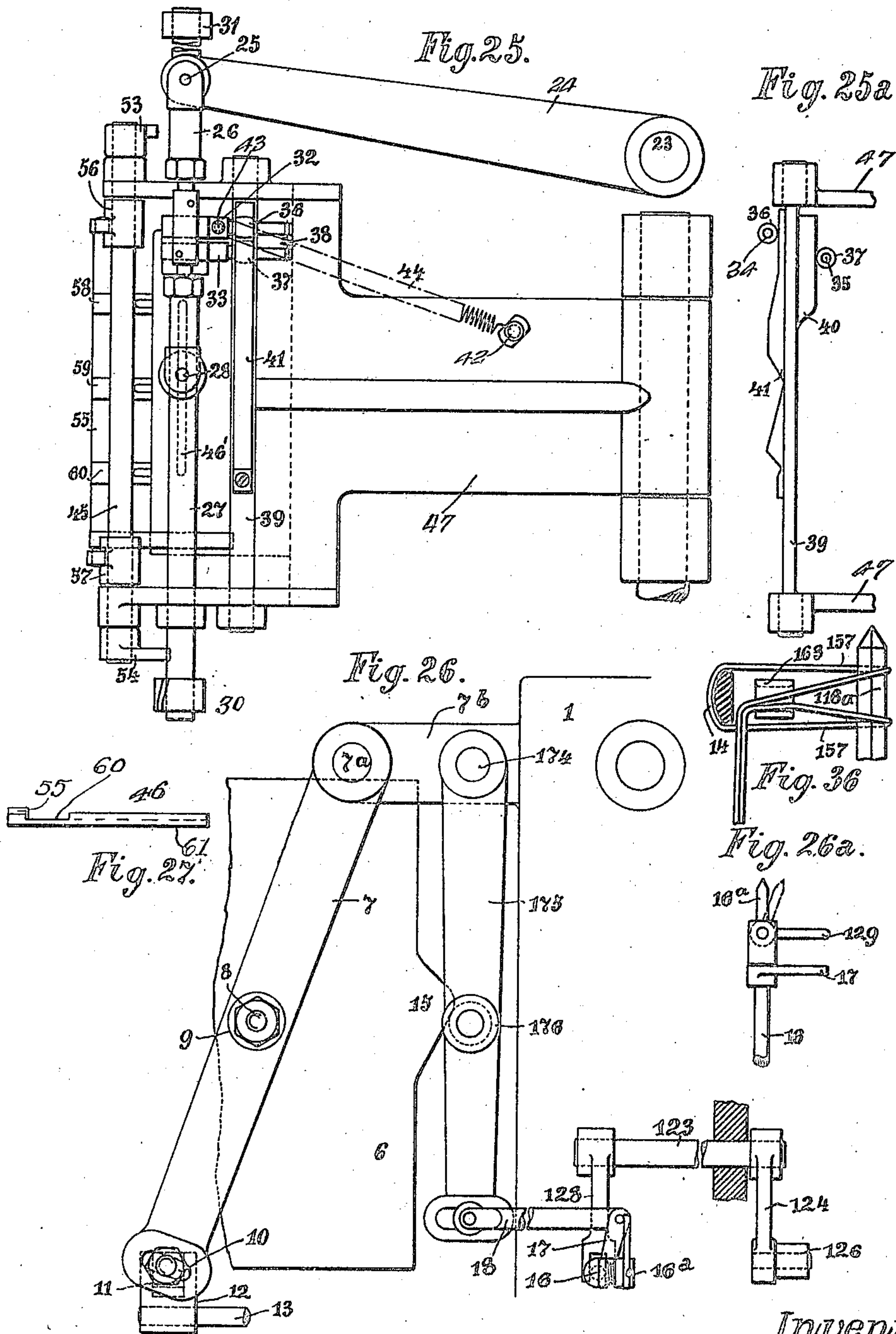
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Fig. 29.

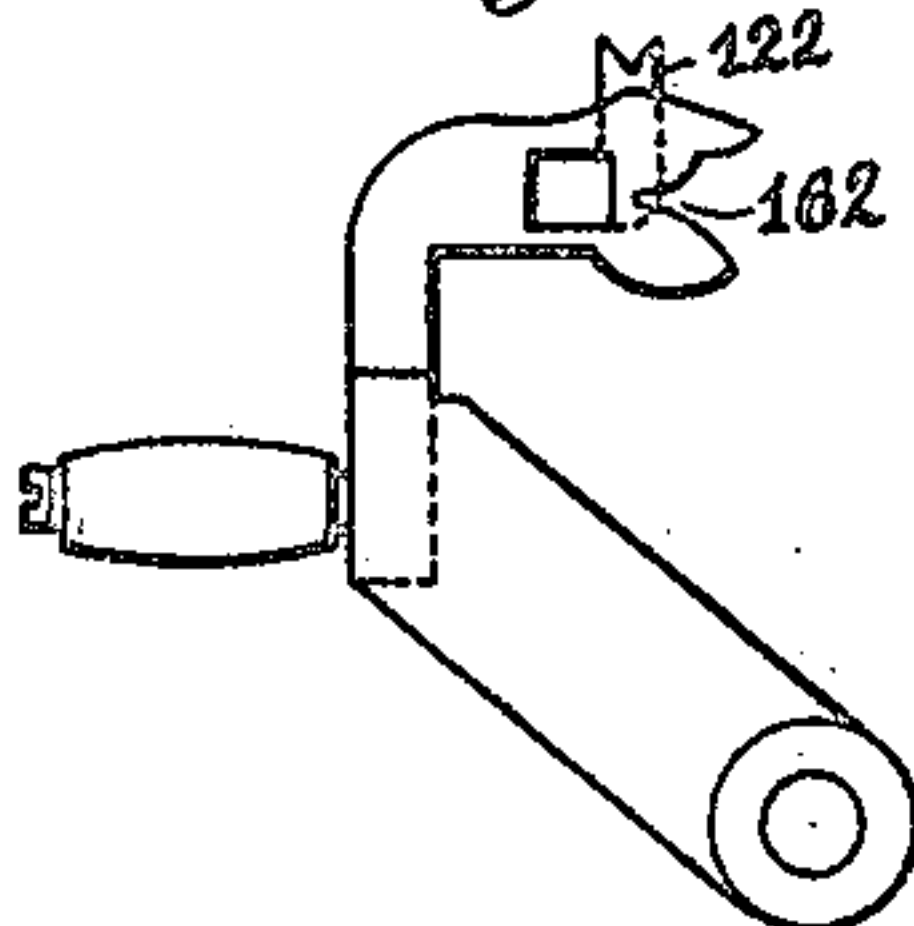


Fig. 30. Fig. 31. Fig. 32.

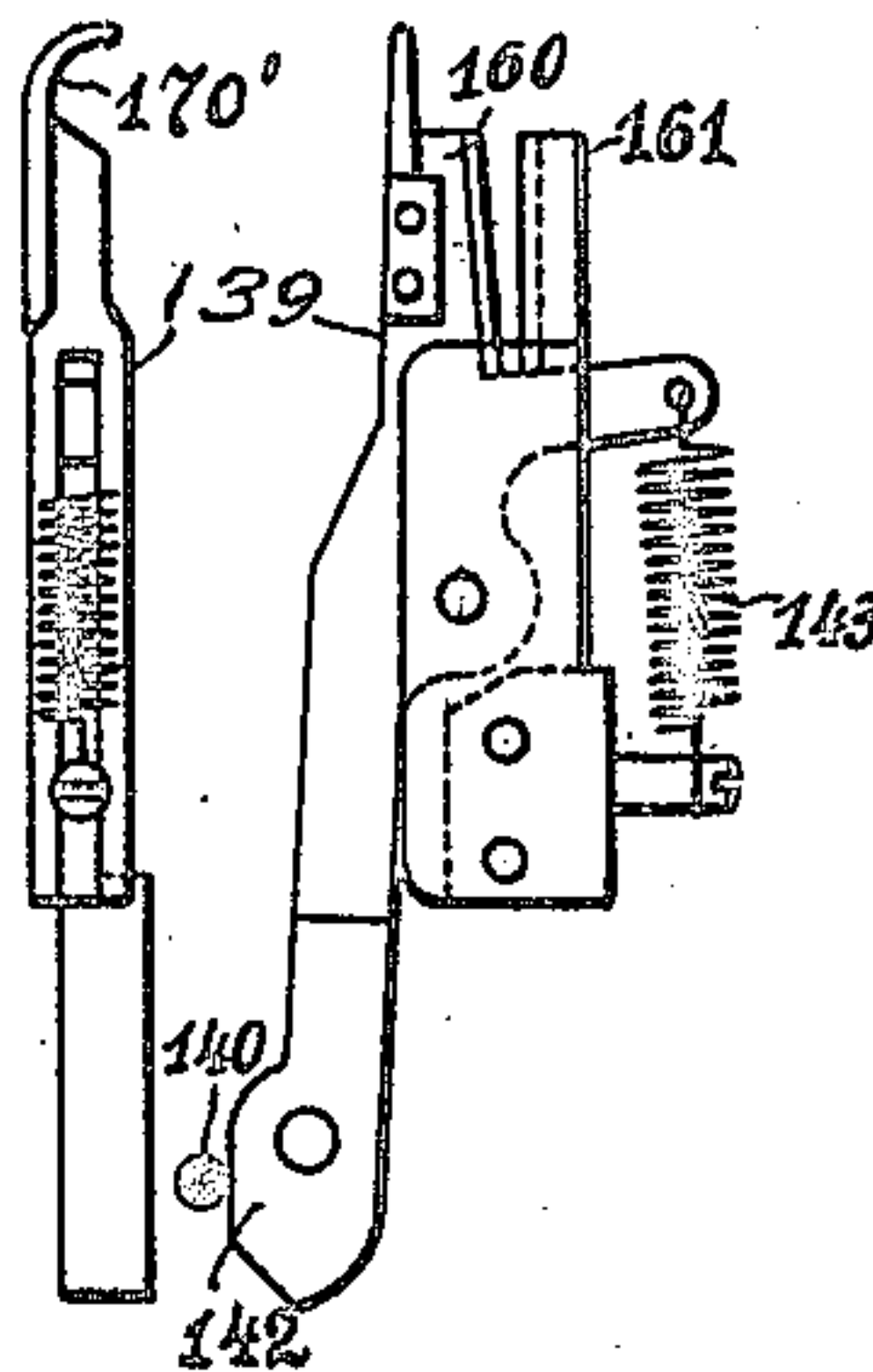
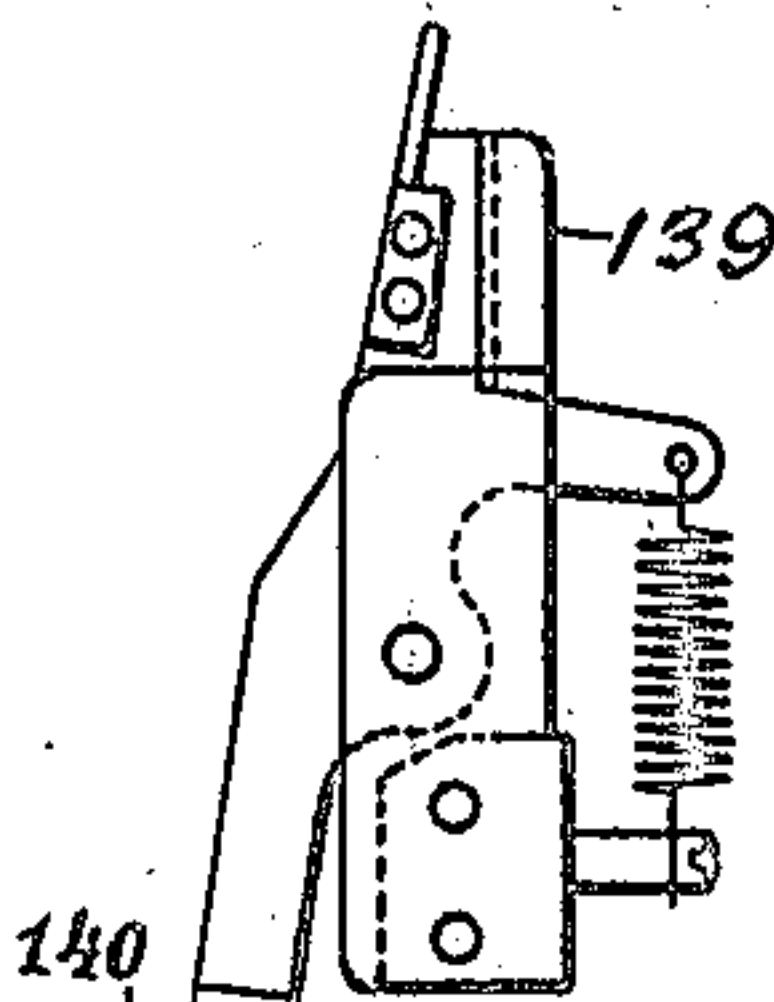


Fig. 35.

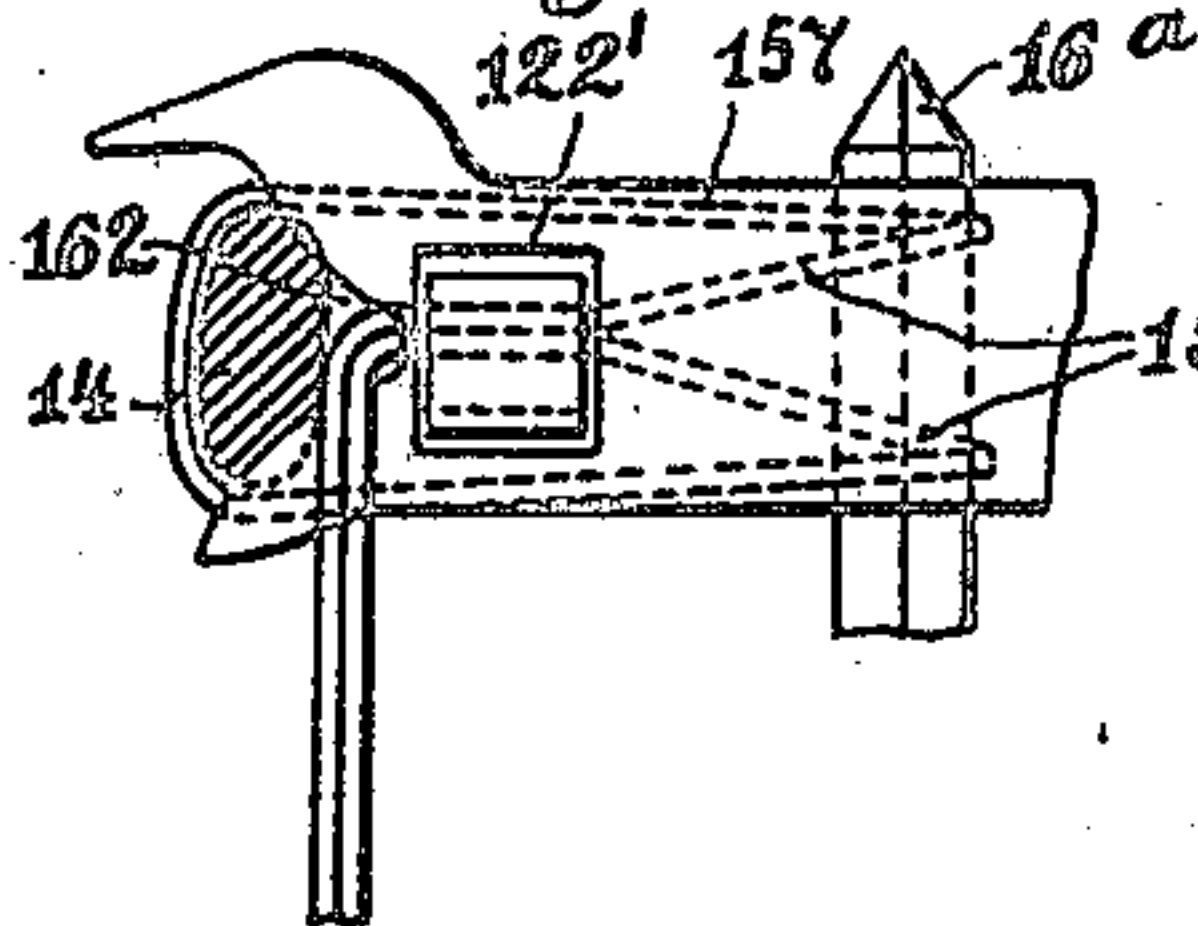


Fig. 28.

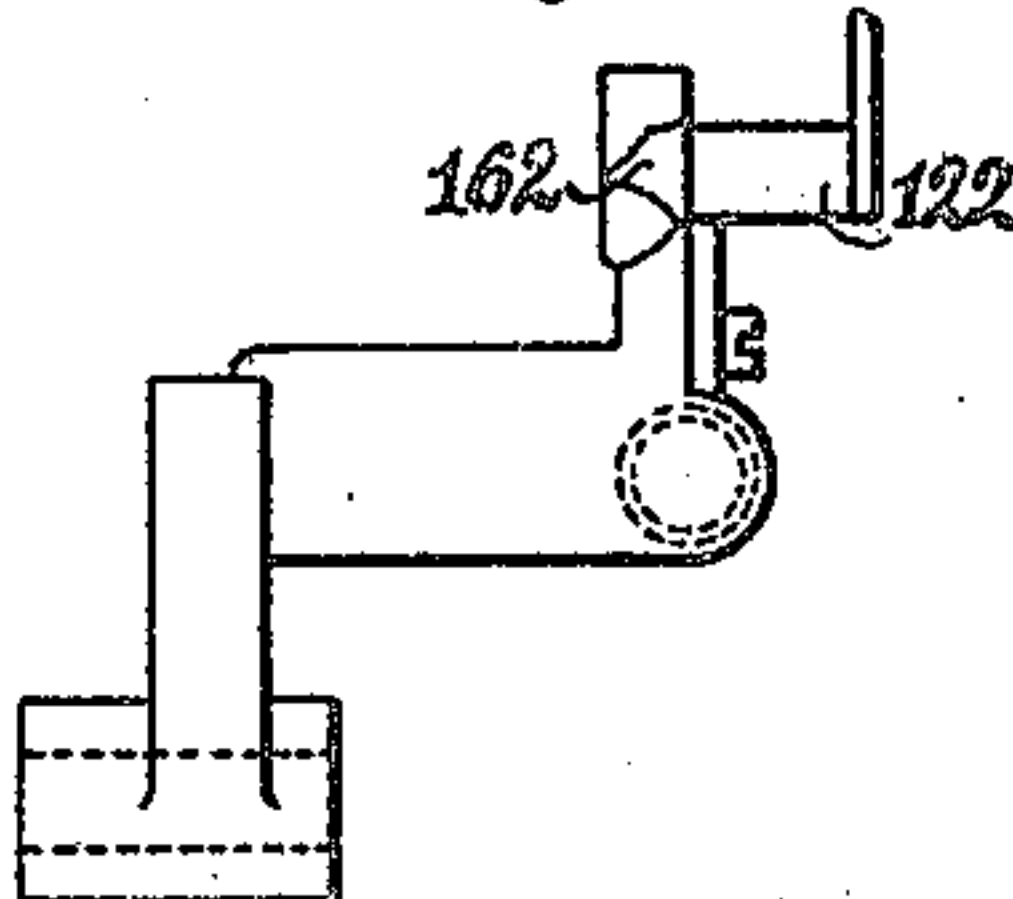


Fig. 33. Fig. 34.

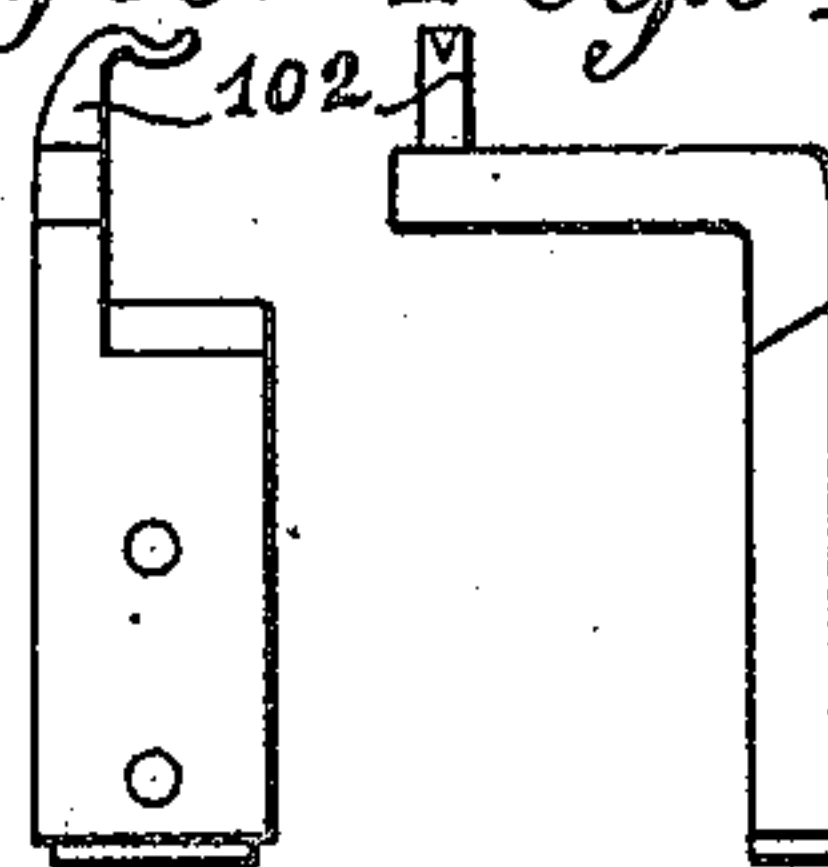


Fig. 37.

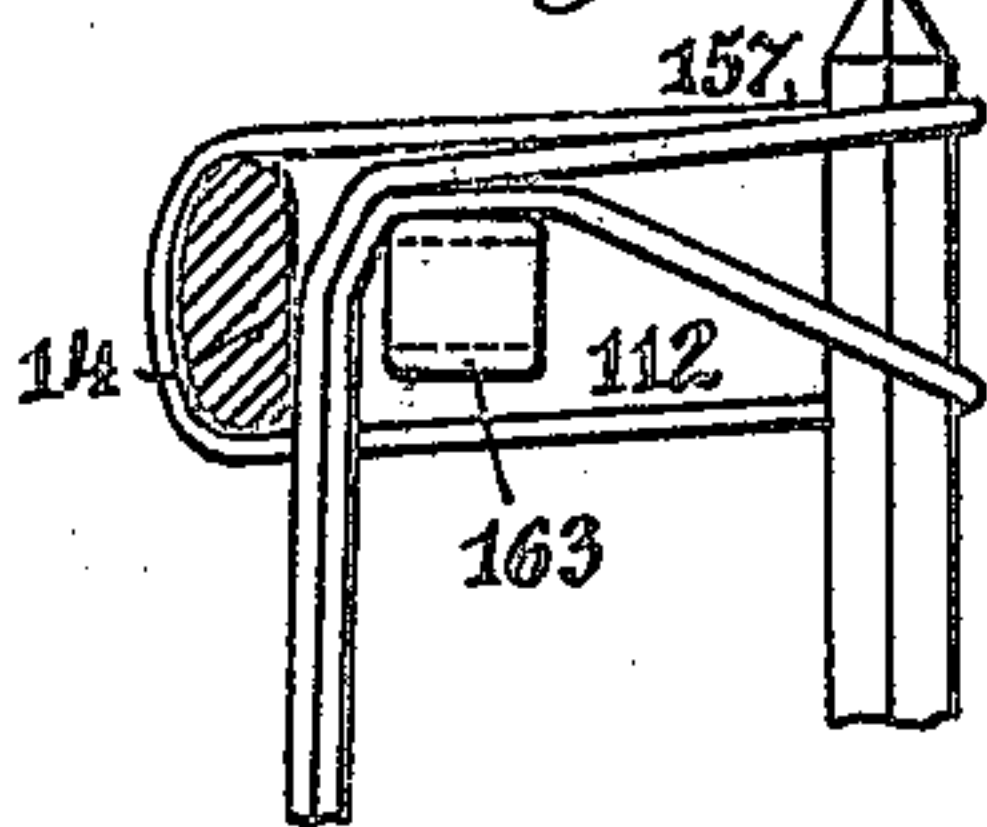


Fig. 38.

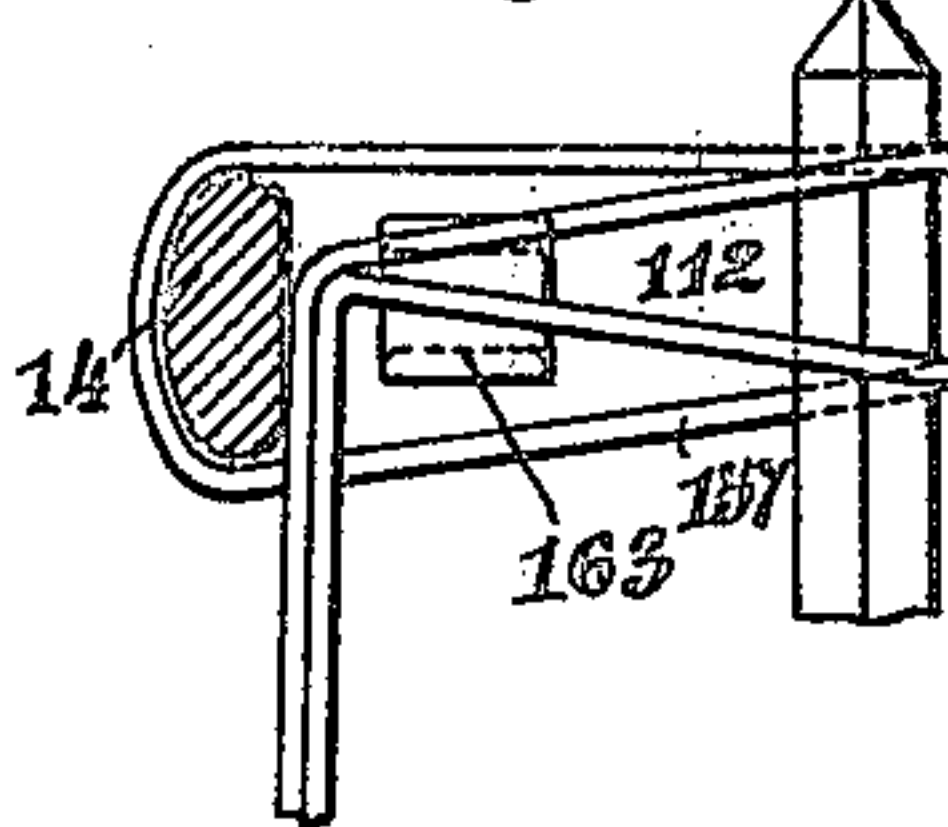


Fig. 39.

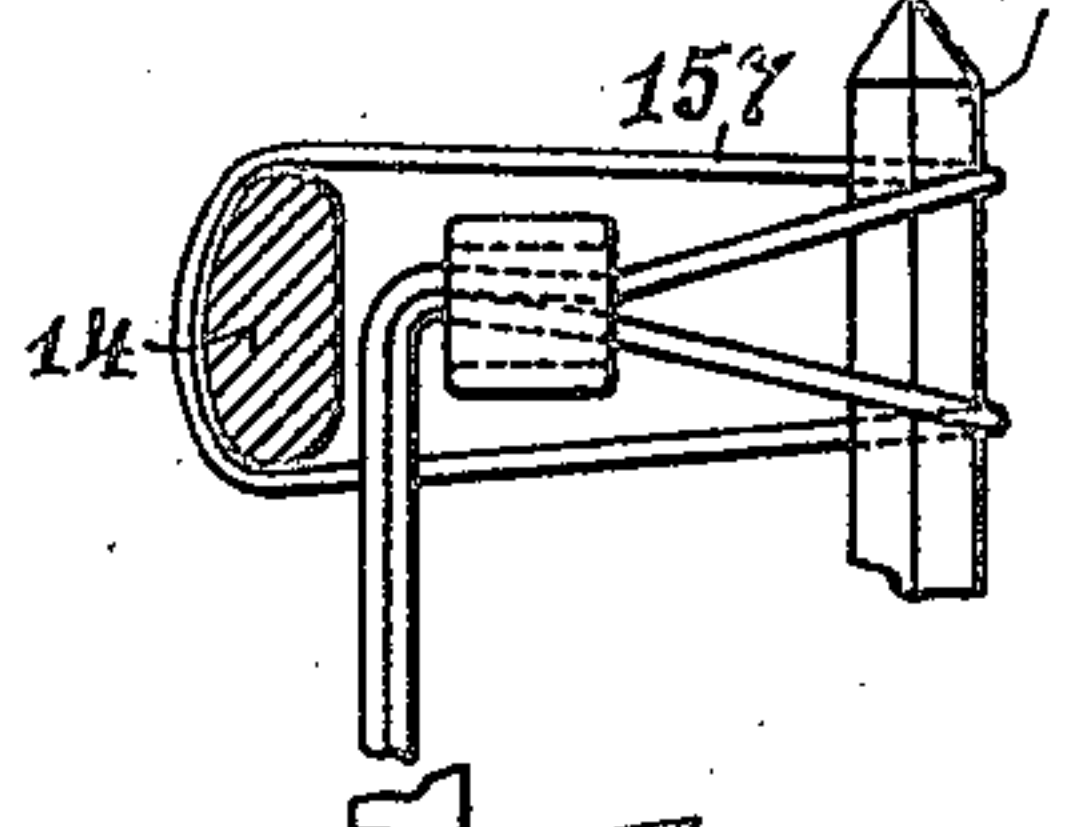


Fig. 40.

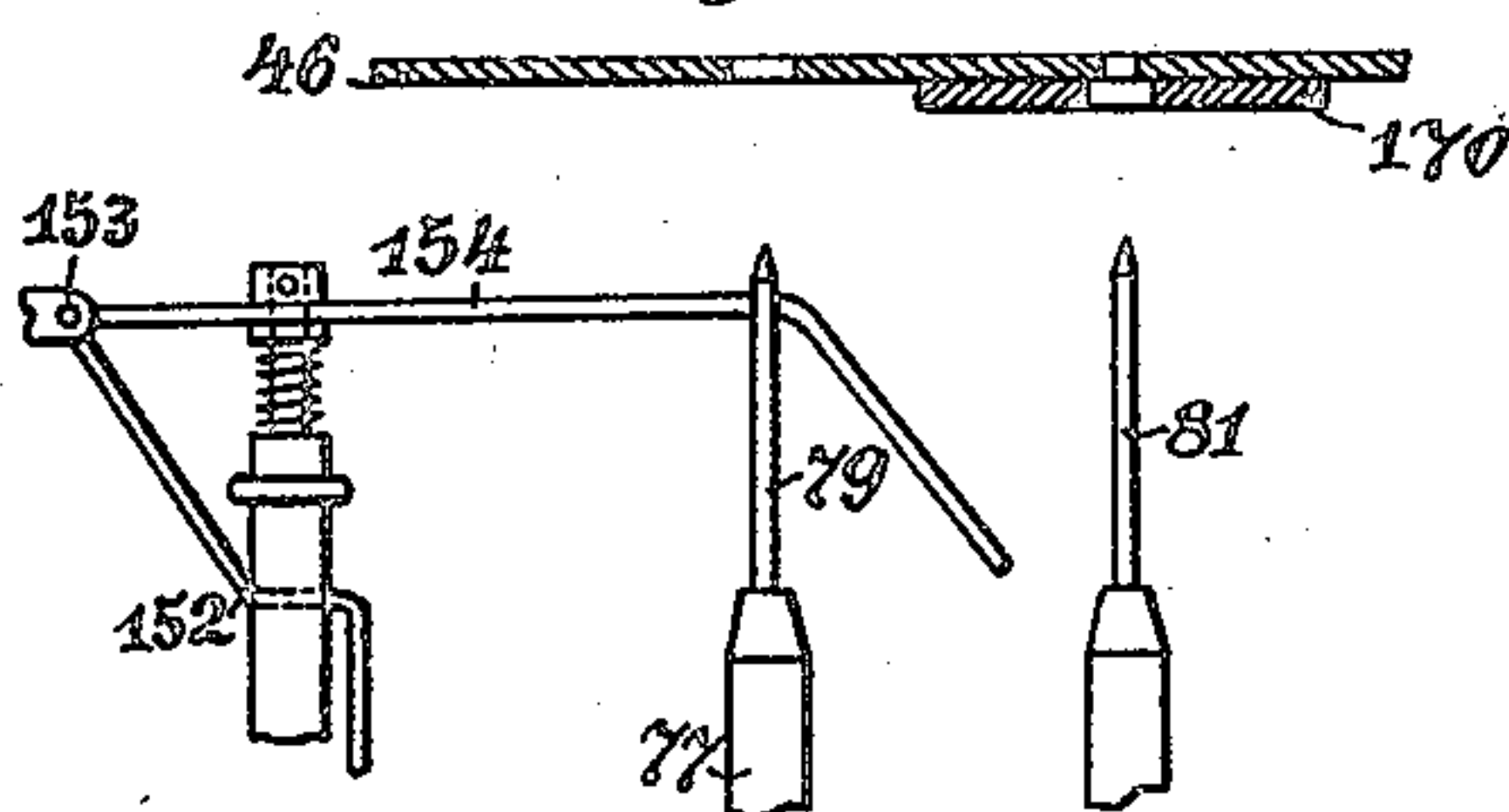
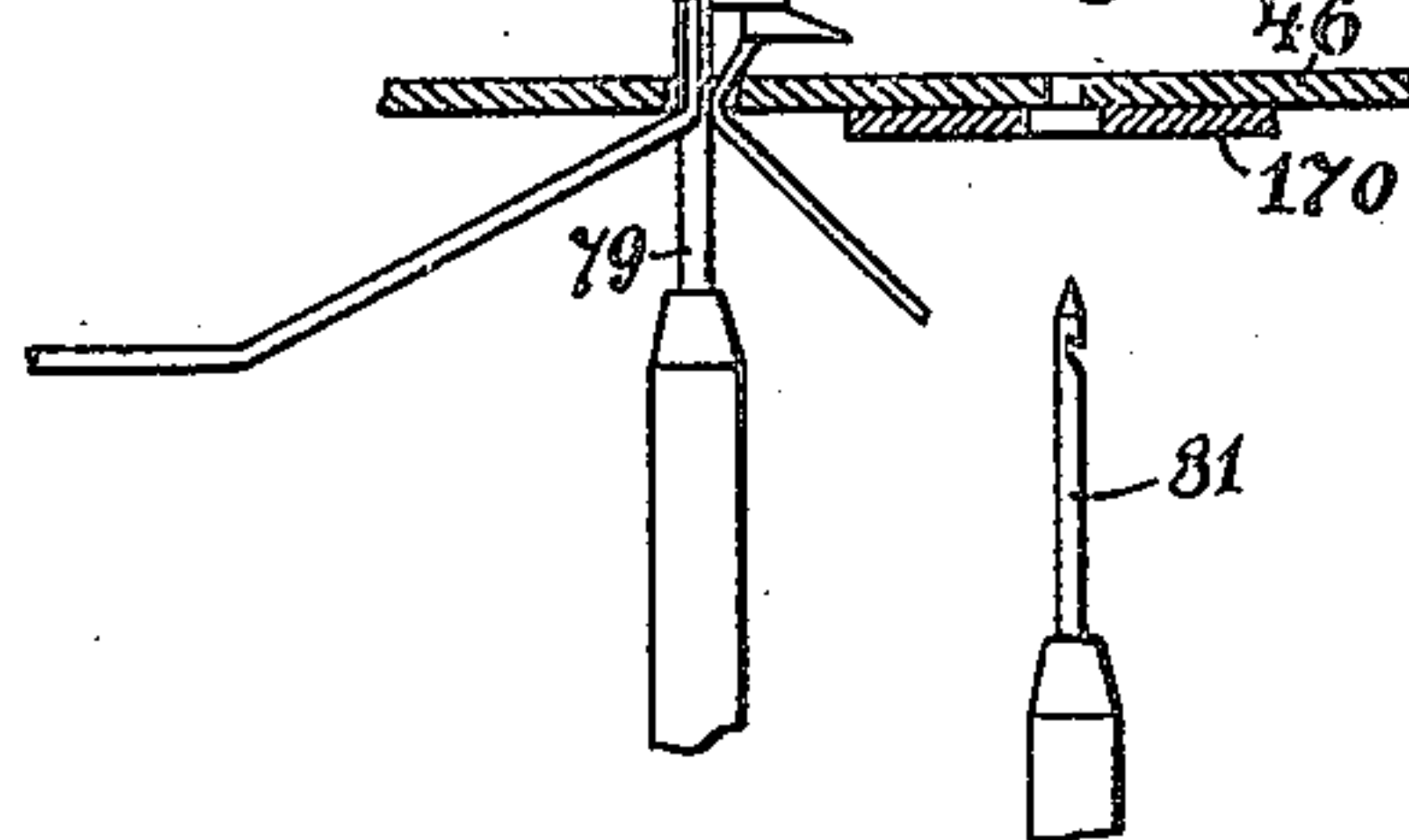


Fig. 40a.



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Fig. 41.

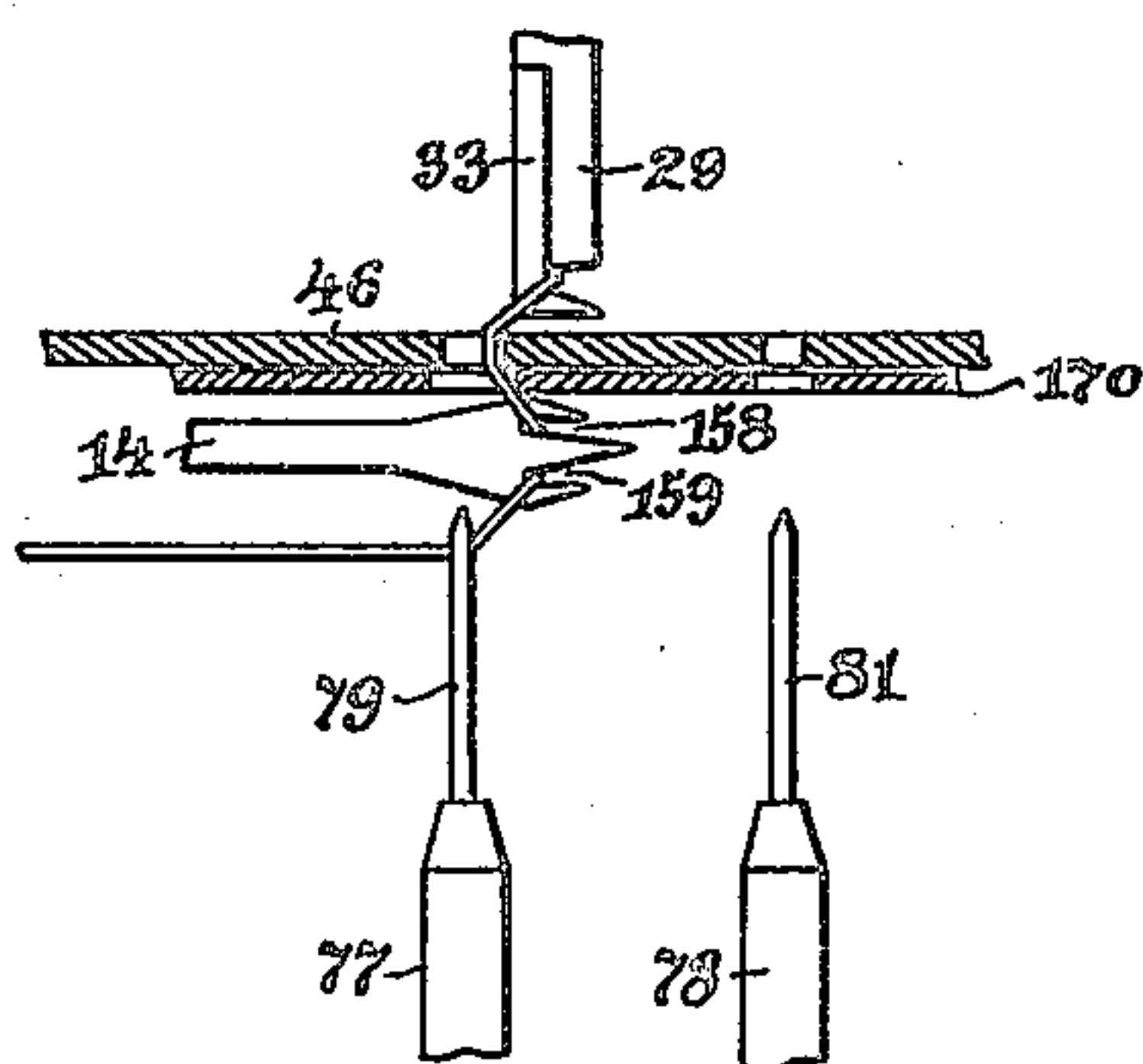


Fig. 42.

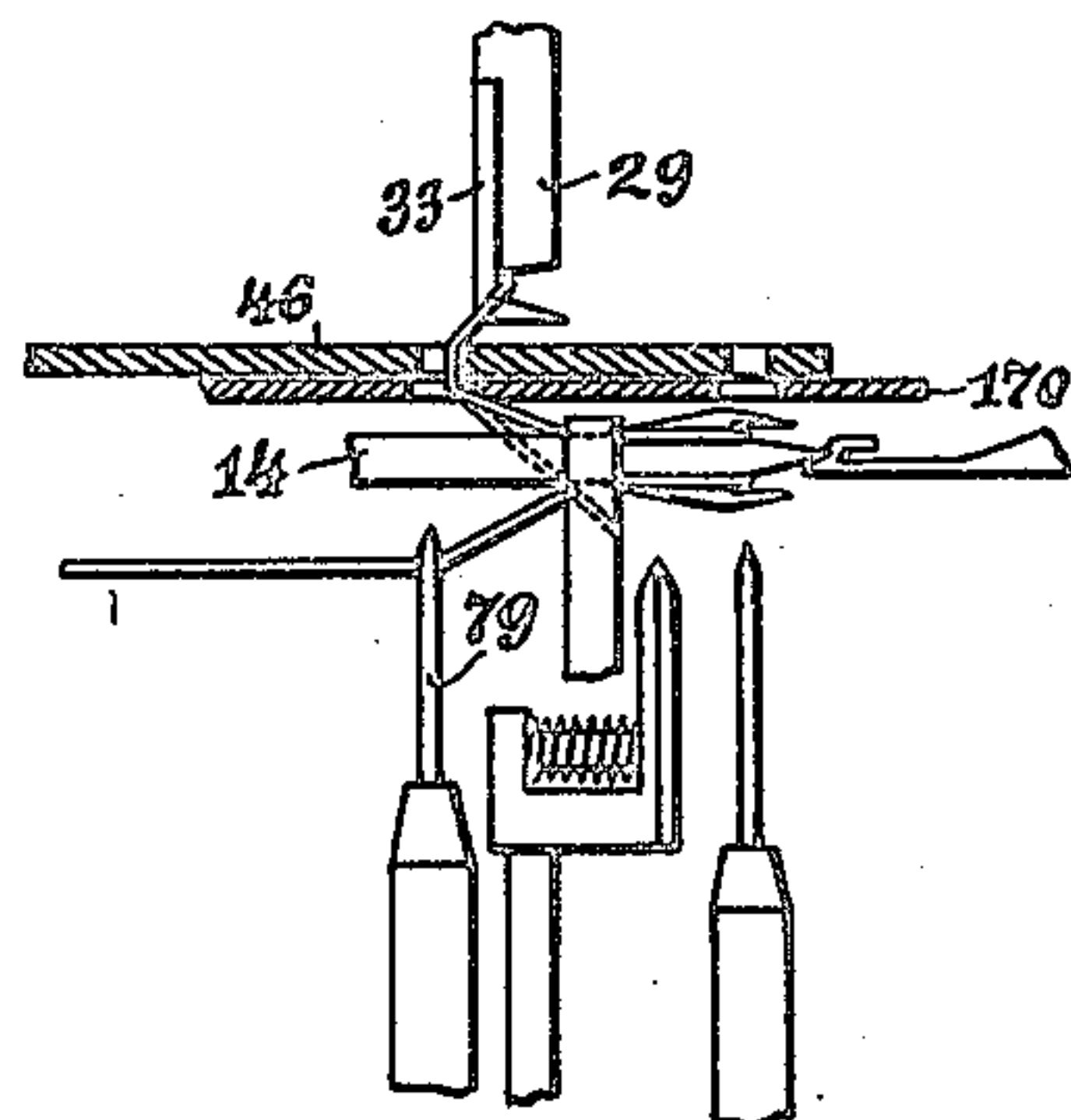


Fig. 43.

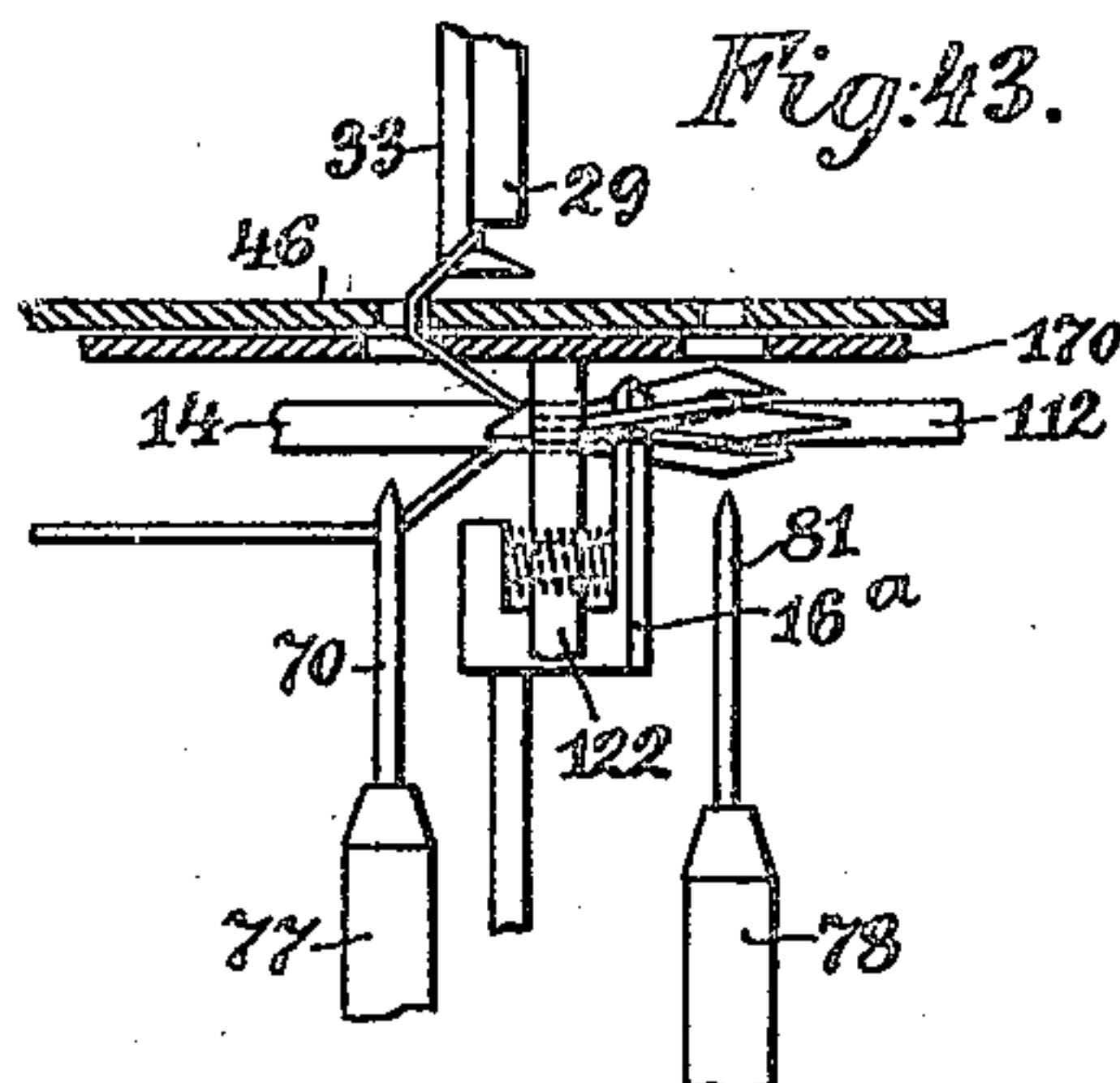


Fig. 44.

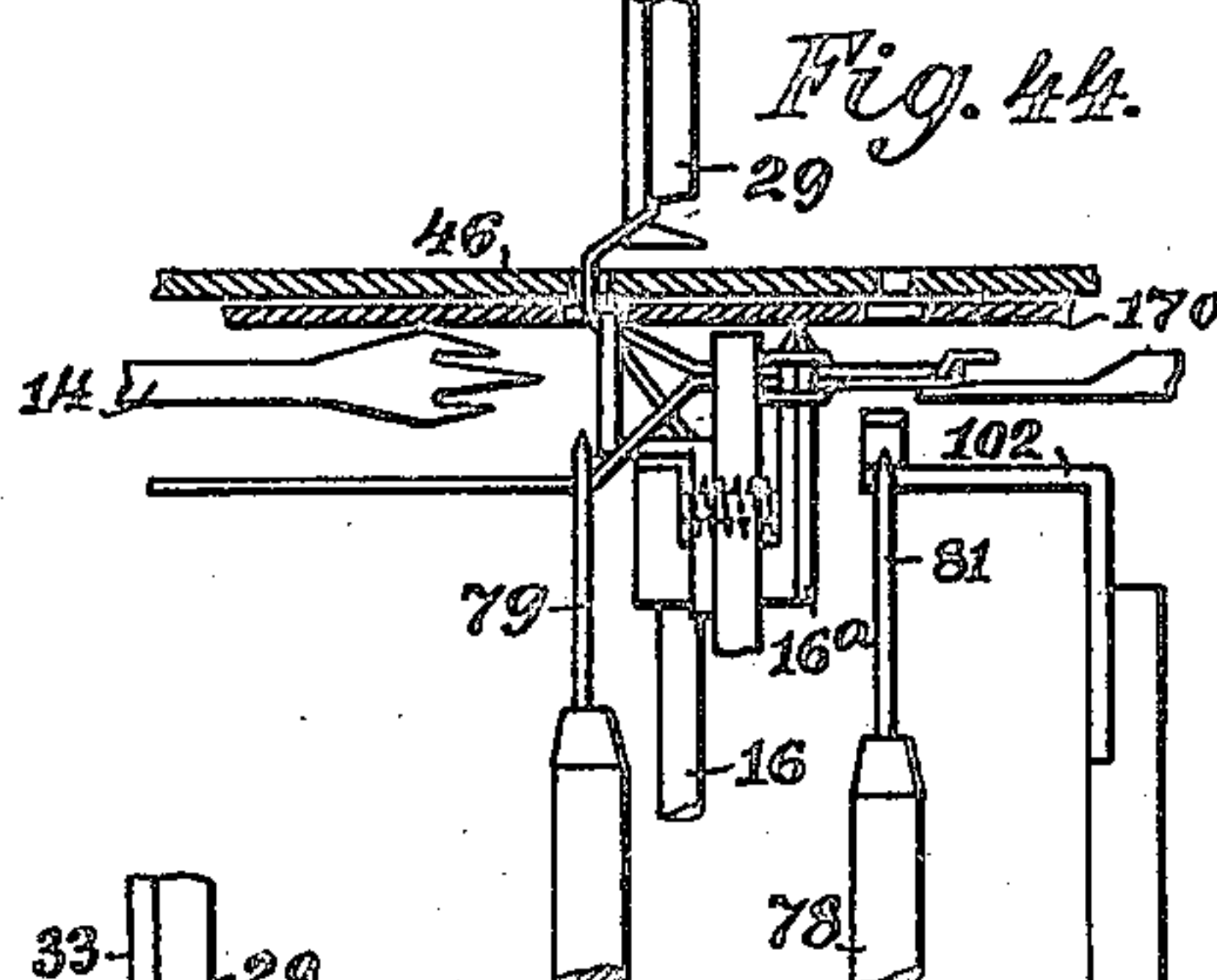


Fig. 45.

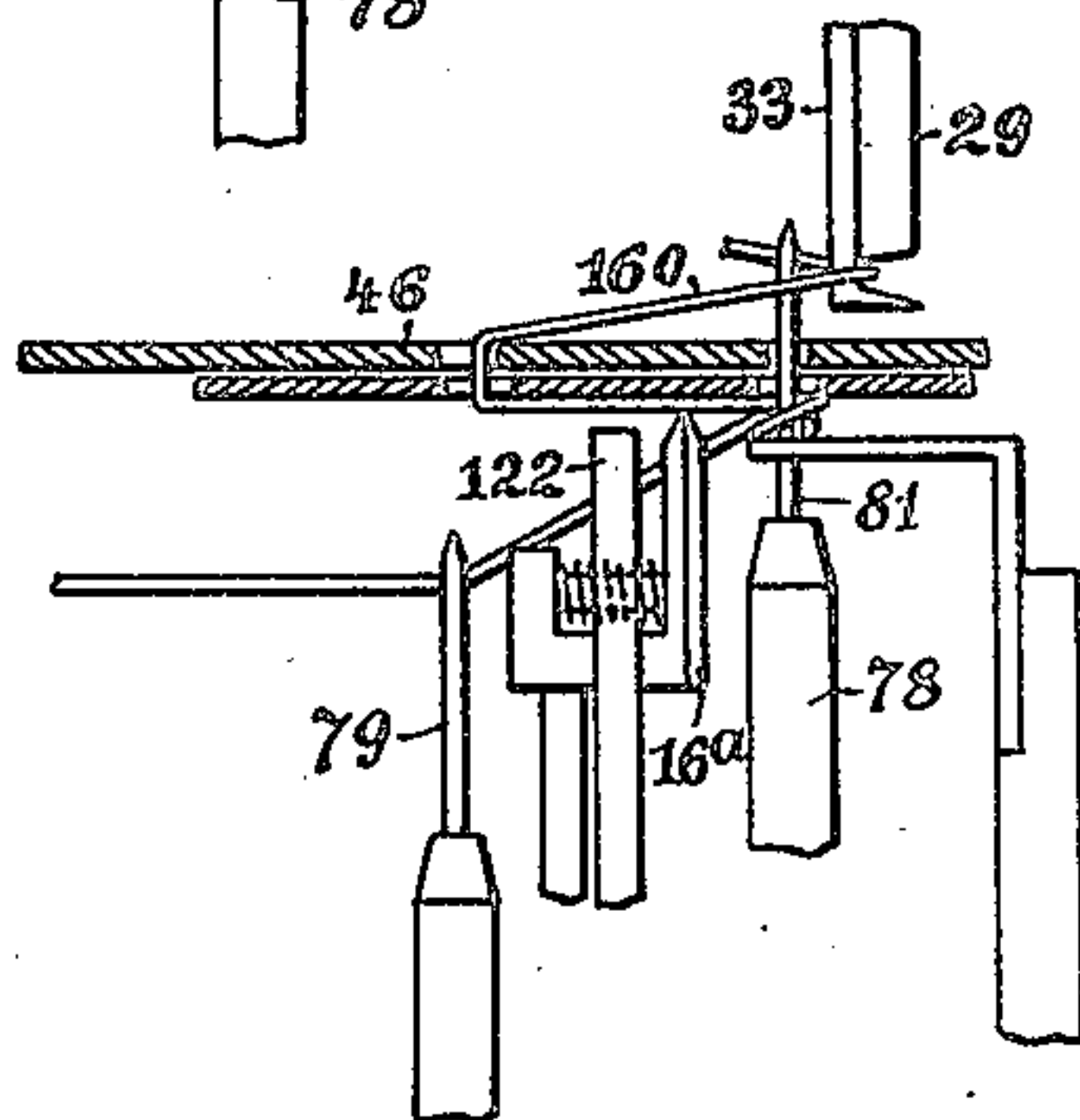


Fig. 46.

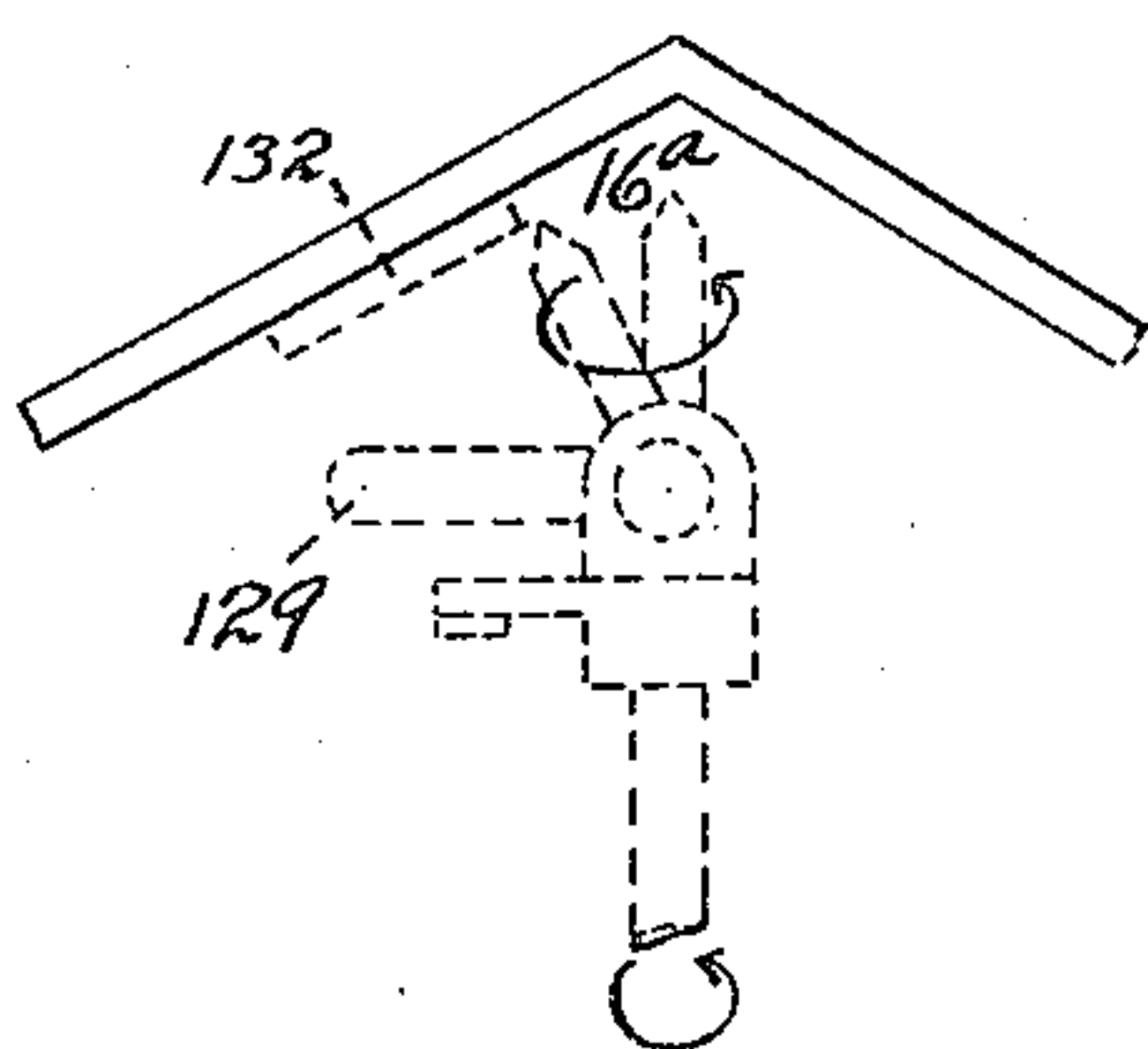
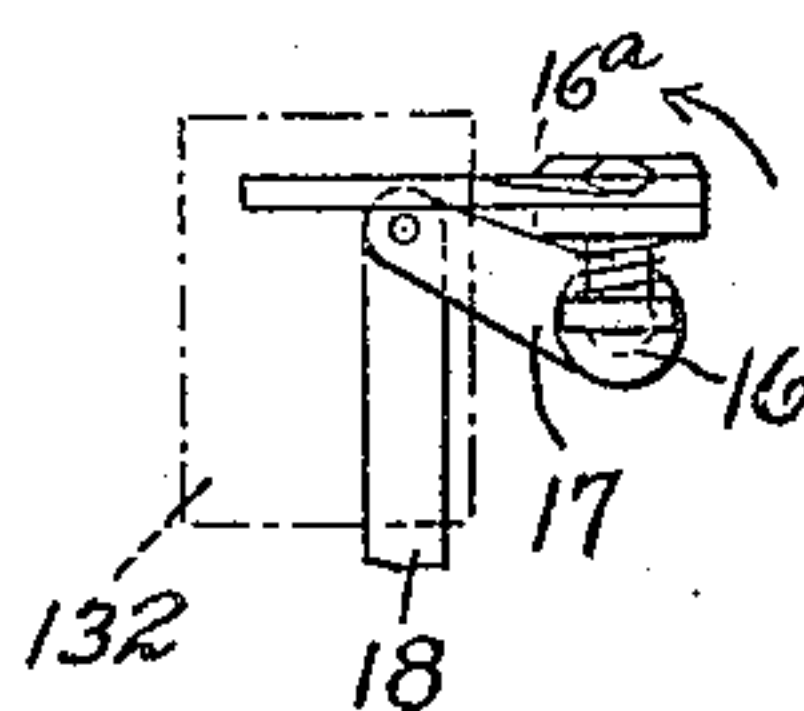


FIG. 47.



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UNITED STATES PATENT OFFICE.

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SHEET-STITCHING MACHINE.

Application filed August 1, 1919. Serial No. 314,720.

To all whom it may concern:

Be it known that I, ULRICH BISCHOF, a citizen of Switzerland, residing at Horgen, Switzerland, have invented certain new and useful Improvements in Sheet-Stitching Machines, of which the following is a specification.

This invention has for its object to provide an improved machine for stitching together sheets with thread of the type comprising three needles and an upper thread looper arranged above the stitching plate.

The improved machine of this invention comprises a thread looper arranged under the stitching plate for placing the thread loop coming from the first needle into a loop formed by the second needle, a rotary shears which, when closed, enters between the loop opened-out by the lower thread looper and the upper looper, and by rotating around a vertical axis opens the latter loop, a hooked needle for engaging the two sides of one end of the latter loop and drawing it through the loop opened out for this purpose, a knot-former for pressing the loop suspended from the hooked needle against the sheet to be stitched, and a tongs for gripping and drawing tight the end of the thread that has been held hitherto by the upper thread looper above the stitching plate, after said end has been drawn by the third needle through the sheet to be stitched and through the loop held by the loop former.

The accompanying drawings illustrate a constructional form of the improved machine to the extent required for understanding the invention.

Fig. 1 is a side elevation of the improved machine.

Fig. 2 is a front elevation thereof viewed from the left hand of Fig. 1.

Fig. 3 is a side elevation view in the direction of the arrow I in Fig. 2.

Figs. 4 and 5 illustrate on a larger scale details of Fig. 2.

Figs. 6 to 8, and Figs. 25 to 34 illustrate details: and

Figs. 9 to 24, and Figs. 35 to 45 illustrate the operation of the improved machine in its various stages of working.

Figs. 46 and 47 are detailed views illustrating the manner of operating the shears.

In the framing 1 is a shaft 2 which can

be coupled to the driving pulley 4 that is loose on the shaft 2, by means of a clutch 3 of known construction (not further described herein) and a treadle 5 (Figs. 1 and 2).

On the shaft 2 is a drum eccentric 6 which imparts oscillatory motion to a lever 7 by means of an antifriction roller 9 mounted on a pin 8 (Figs. 3 and 26). The lever 7 is fixed on a shaft 7^a which is rotatably supported in bearings 7^b of the framing. On the lever 7 is fixed a pin 10 carrying a rotatable block 11. The latter engages a driver 12 which is fixed on a shaft 13 mounted in the framing 1. This shaft carries the lower thread looper 14. The front of the eccentric 6 has fixed on it a second nose 15 (Fig. 26) which is arranged to strike and move at intervals a roller 176 fixed on the lever 175. The free end of this lever is connected by a rod 18 to an arm 17 on a bar 16 which latter is mounted vertically on the framing 1 and carries the shear blades 16^a (Figs. 2, 3, 5 and 26).

On the shaft 2 there is further fixed a cam 19 which imparts oscillatory motion by means of a pin 21 and antifriction roller 22 to a lever 20 fixed on the vertical shaft 23 mounted in the framing (Fig. 1). On the shaft 23 there is also a lever 24 provided with a pin 25. A rod 26 connects this pin 25 to a pin 28 mounted on the rod 27, so that this rod 27 the upper thread looper 29 fixed on this rod, the noses 30 and 31, the arm 32 fixed on the rod 27, and the arm 33 loose thereon, can be moved laterally. The two arms 32 and 33 are provided with pins 34 and 35 fitted with antifriction rollers 36 and 37, and these pins are pressed by a tension spring 38 against cam bars 40 and 41 fixed on the shaft 39 (Figs. 1, 25 and 25^a). Both arms 32 and 33 are curved at the right end, as shown in Fig. 1, but the end of the arm 32 lies over and the end of the arm 33 under the horizontal plane of the rod 26. Further the arm 32 is pressed against the cam bar 41 by a tension spring 44 connected to the pins 42 and 43. The pin 42 is mounted on the arm 32, whereas the pin 43 is fixed on the framing 1.

The rods 39, 27 and shaft 45 are mounted on a lever 47 which is provided with a stitching plate 46 and is fixed on a shaft 48 mounted in the framing. On this shaft is a lever

49 fitted with a pin 50 carrying an antifric-
tion roller 51, and adapted to be actuated by
a cam 52 fixed on the shaft 2. On the shaft
45 are levers 53 and 54, and also levers 56
5 and 57 carrying a bar 55. To the bar 55 are
bolted tongues 58, 59, 60 each formed with a
slot. The tongues engage in grooves 61 in
the underside of the stitching plate 46. Un-
der this plate is the table saddle 62 of the
10 framing with the two table plates 63, 64.
Upon these latter plates the material to be
stitched is placed. On the shaft 13 is an
arm 65 carrying a pin 66 and an antifric-
tion roller 67 which rests on a cam bar 68 mount-
15 ed on the framing (Figs. 1 and 6); and is
pressed against this cam bar by a tension
spring that is connected to pins 66 and 69.

On a shaft 72 (Figs. 1 to 4) mounted in
the framing, are mounted bell crank levers
20 73, 74, 75 carrying pins 91, 92, 93 fitted with
antifric- tion rollers 97, 98, 99 bearing against
cams 82, 83, 84 mounted on shaft 2. These
levers 73, 74, 75 are connected by rods 85, 86,
87 to the needle bars 76, 77, 78 in which the
25 stitching needle 79 and hooked needles 80,
81 are respectively mounted. The rotary
motion of shaft 2 causes these needle bars
with their needles to move up and down.
The shaft 72 carries a lever 100 fulcrumed
30 intermediately of its length which serves to
actuate the rod 101 mounted in the framing,
and the thread trigger 102 (Figs. 1, 2, 5, 33
and 34). The lever 100 receives its motion
from the cam 103 mounted on shaft 2, by
35 means of an antifric- tion roller 108 carried
by the end 107 of the lever. The lever 100
transmits its motion through a pin 105 to
the link 104, and thence through the pin 106
to the rod 101.

110 is a lever fulcrumed at 109 on the
framing for actuating the bar 111 (carrying
the hooked needle 112) by means of the
clamping sleeve 113 and link 114 (Fig. 2).
The antifric- tion roller 117 mounted on the
45 lower end of lever 110, bears against the cam
119 on the shaft 2. To the bar 13 there is
fixed a cam 120 (Figs. 2 and 5) for actuating
the loop catcher 122 which is mounted on the
pin 121 mounted in the framing. The shaft
50 123 mounted in the framing has an arm 124
carrying an antifric- tion roller 126 which
bears against the periphery of the cam 127
(Fig. 3) mounted on shaft 2. The shaft 123
has also a forked lever 128 which engages the
55 underside of the shears 16^a on the shaft 16
and causes the said shears to open and close
(Figs. 2, 3, 5, 26, 26^a).

In the upward movement of the rod 16 the
lever 129 fixed to one of the blades of the
60 shears, strikes a pin 130 on the bracket 131
and thus causes this shear blade to open. As
the raised shears are rotated laterally around
shaft 16, the opened blade is closed again by
coming in contact with a stop 132 on the rear
65 table plate 63 (Fig. 3). As may be seen from

Figs. 3, 5 and 9 to 16, the knotting action
takes place in the upper part of the cham-
ber enclosed by the plates 63 and 64, and di-
rectly below the top of the angle. The shears
are shown in Fig. 3 in their lowermost posi- 70
tion and during action they are raised to the
position shown in Figures 16 and 46. The
blades of the shears 16^a are arranged to one
side of the shaft 16. Therefore, when the
shaft turns on its axis, the blades describe an 75
arc around the axis of the shaft 16. When
the shaft 16 turns while in its raised posi-
tion, the point of one of the open blades en-
gages the stop 132 and the shears are thus
closed (see Figures 46 and 47). 134 is a le- 80
ver on a shaft 133 mounted in the framing;
its lower arm carries an antifric- tion roller
136 which slides along the cam 137 (Figs. 2
and 3). On the same shaft is a lever 138
with a tongs 139 adapted to be operated by 85
a cam 137 (Figs. 3, 30-32). The tongs 139
have two jaws 160, 161 of which one is pulled
towards the other by a spring 143.

The lever 144 fixed on the shaft 141 mount-
ed in the framing, slides with the antifric- 90
tion roller 146 against the cam 147 and
causes the lever 140 fixed on the same shaft,
to press against the nose 142 situated on the
tongs so as to open these tongs (Figs. 5,
30-32). On this nose being released the ten- 95
sion spring 143 closes the tongs again. This
opening and closing of the tongs by means
of the pin 140 takes place only in the upper-
most position of the tongs, when the tong-
actuating nose 142 is situated quite close to 100
the lever 140 (Figs. 2, 3, 5).

The operation of the improved machine is
as follows:—It is assumed that the parts of
the machine are in the positions shown in
Figs. 1 to 5. 105

The reel 148 containing the supply of
thread is mounted on a pin 149 (Fig. 4) on
the framing. The thread passes thence
through brake block 150 (not further here-
indescribed), the thread clips 151, 152, the 110
bore of a thread-tensioning device 153 (acted
upon by the pull of a spring) and between
the brake blocks 154 to the needle 79. The
thread is held tightly by the brake blocks
154. The sheet —a— to be stitched is laid 115
with the fold upon the ridge of the two
table plates 63 and 64.

When the operator desires to start the
machine, he presses the treadle 5 down with
his foot, thereby releasing the clutch pin 120
155 which has been held back hitherto, and
which is thus caused by a spring 156 to
engage teeth provided on the hub of a driv-
ing pulley 4 loose on shaft 2, and thereby
set the latter in motion. The lever 47 125
which is under the influence of the cam
52, now moves the stitching plate 46 down-
wards which is caused by the weight of the
lever 47 to press firmly upon the sheet —a—
to be stitched. By the action of the cams 130

82, 83, the needles 79 and 80 are first driven through the sheet to be stitched and through the holes in the stitching plate (Figs. 10 and 11); the arrangement being such that the stitching needle 80 is caused by a spiral groove 173 in the spindle 77 and a fixed stud 173' engaged in said groove, to make a quarter of a revolution, so that when the needle is in its highest position its hook is directed towards the rear.

The action of the cam 82 is such that when the stitching needle 79 with its thread, has reached its highest position, it will move back again for a slight distance with the result that a loop is formed in the thread above the sheet to be stitched (Fig. 10). The cam 19 now pushes the upper thread looper 29 in Fig. 10 to the right, so that the thread is caught and drawn out by the said looper.

In the underside of the stitching plate 46 there is provided a longitudinal slot groove 46' for receiving the upper stitching thread (Fig. 25). During the passage of the needles through the material this groove is covered at the location of each needle by the tongues 58, 59, 60 (each formed with a slot) respectively, in order that the needles shall not be able to drag the paper in with them in entering the stitching plate (Figs. 1, 2 and 25).

When the loop has been caught by the upper thread looper 29, the stitching needle 79 moves back into its lowest position, whilst the length of thread comprised between the sheet to be stitched and the needle 79 assumes a stretched vertical position. The cam 6 now causes the lower thread looper 14 to move to the right until its longest prong extends slightly beyond the thread. The looper 14 is then caused by the action of the cam bar 68 and lever 65 to move towards the rear (Figs. 11 and 12), whereby the thread is drawn out into the form of a loop 157 and placed into the two thread rests 158 and 159 of the thread looper 14. The upper thread looper 29 meanwhile holds the thread in such a manner that the end 160 of the thread lies against the back of the hooked needle 80. In the position of the lever 33 shown in Fig. 11, the end 160 of the thread lies upon the thread looper 29 and is held at that point. The hooked needle 80 is then moved downwards by the cam 83, so as to draw the thread out into the form of a loop 161 (Fig. 12), the said needle turning back again through the aforesaid quarter of a revolution. These movements of the needle 80 give to the loop 161 a position such that the thread looper 14, in moving forward, passes through this loop, and as a result the loop 157 is drawn through the loop 161.

During this procedure the loop catcher 122 is caused by the cam bar 120 to move

across the thread looper 14 and catch the sides of the loop 157 (Figs. 3, 5, 12). On the bar 68 shown in Figure 6, the upper surfaces arranged at the sides of the elevation or ridge are in different planes. When the roller 67 rests on the higher surface at the left of the elevation or ridge, the looper 14 is in the normal position. When the roller rests on the elevation the looper is in the rearward position, and when the roller lies on the lower surface at the right of the ridge, the looper is in the forward position. During the passage of the thread looper 14 through the loop 161, the said looper is caused by the cam bar 68 to move forwardly, and thereby open out the loop 161 still more, in order that the thread looper 14 shall slip through with complete certainty. Before this looper has drawn out the loop 157 completely, it is caused by the cam bar 68 to make again a rearward movement, whereby it comes close to the horizontally situated hooked needle 112. In this position the closed shears 16^a passes up from below between the drawn-out loop 157 and the thread looper 14, whereupon the shears by rotating around shaft 16 (Fig. 19) draw out the two sides of the loop 157 into the form of a horizontal loop 157^a and pushes it into a slot 162 of the loop catcher 122 (Figs. 19, 20, 35).

Meanwhile the sides of the thread loop 157 are kept apart from each other by the two thread rests 158 and 159 of the thread looper 14. The hooked needle 112 is now pushed horizontally through the loop 157 (held apart by the thread looper) into the opening 122' of the loop catcher 122 (Figs. 13, 20, 35) in which position the two sides of the loop 157^a which are forced together at this point of the loop catcher, slip upwardly over the inclined surface 163 of the hooked needle 112 (Figs. 36-38).

As the hooked needle 112 now moves back, it catches the two last mentioned sides of the loop 157^a and draws them between the other two sides of the loop 157 (Figs. 14, 21, 39) and out through the same, whereupon the loop 161 is released from the hooked needle 80 by an upward movement, and the shears 16^a make a rearward rotation so as to bring the double loop situated upon it in a straight line with the needles (Figs. 22 and 23).

The trigger 102 now moves upwards, thereby engaging the rear sides of the last mentioned double loop between the shears 16^a and the hooked needle 112, pressing it against the sheet to be stitched. At the same time the third hooked needle 81 passes with its hook rearwardly through the double loop and pierces the sheet to be stitched, thereby engaging the end 160 of the thread carried by the thread looper 29.

At the same time the loop that has been

carried hitherto by the hooked needle 112 and the shears 16^a, is released by the downward movement of the rod 16, whereupon the loop being drawn tight by the tension of the thread, fits closely around the knotter and hooked needle 81 (Figs. 15 and 24). The loop 161 (Figs. 12) is released at the same time as the loop 157 (Fig. 14), whereupon the released thread is drawn out by the thread looper 29 over the sheet to be stitched, is engaged by the hooked needle 81 and drawn down by the knotter and the thread looped around it, and drawn through the tongs 139 which have been opened by the pin 140 striking against the nose 142 (Figs. 16, 30, 31 and 32).

As soon as the end 160 of the thread has entered the tongs, the latter closes and moves forwards, the trigger moving down and releasing the loop for the purpose of tightening the knot by the tongs and drawing the thread tight (Fig. 16).

In order to release the loop the shears 16^a have made a downward movement, and then they rotate slightly on their own axis 16 in such a manner that the shears lever 129 in its next ascent strikes the pin 130 (Figs. 3, 20), opens the shears and then in its opened state moves down a short distance. The shears remains in this position until the knotting operation has been completed; it then moves up; the thread 165 (Fig. 16) to be severed, lying between the two open shears blades; whereupon the shears rotate on their axis.

The opened shears blade hereby strikes the stop 132 (Fig. 3) and closes again so completely as to sever the thread, whereupon the shears moves down again into its lowest position.

Whilst after the looping operation the thread looper 14 returns into its initial position, the loop catcher 122 moves again forwardly, but then immediately moves back again, and the point 166 of the loop catcher (Figs. 16 and 3) engages and holds the thread 165 which is to be cut off. As soon as the upper thread looper has completed its stroke towards the right, the nose 31 by striking the lever 53 causes the tongues 58, 59, 60 to uncover the slot 46' in the stitching plate 61, the lever 53 acting to rotate the shaft 45 that moves the said tongues. In the return movement of the thread looper shaft 27, the inclined surface 168 of the nose strikes the lever 54, thereby pushing the tongues in again, so that the needles will be able in the next working stroke to pierce the sheet to be stitched.

In cases where a label is to be stitched instead of a sheet, and the thread has to be drawn through the aperture in the label and to be knotted, the stitching needle 79 is inserted in the bar 77 and the thread 154 is threaded through the said needle (Fig. 40). The needle 81 will now pass through the

aperture in the label, and the operation is as follows:—

The label 170 is placed upon the saddle of the table so that its aperture comes over the needle 81; it is held in this position by the descent of the stitching plate 46. The stitching needle 79 now moves upwards, but when the needle 79 has reached its highest position, it will move back again for a slight distance with the result that a loop is formed which loop is caught by the upper thread looper 29, (Figs. 41). The stitching needle 79 now moves down to the fullest extent, whereupon the thread is caught by the lower thread looper 14 and drawn out into the form of a loop the sides of which rest in the rests 158 and 159 of the thread looper 14 (Figs. 41 and 42). The knotting of the drawn out loop is effected as follows: The shears 16^a pass from below between the thread looper 14 and the loop 157 (Fig. 43), and then by a rotational movement around the shaft 16, pull the said loop out transversely, whereupon the horizontal hooked needle 112 enters the loop, engages the sides of the loop that are pressed together by the loop catcher 122, and draws them out in the return movement of the hooked needle (Fig. 44). Then the thread looper 14 is moved completely back so as to release the loop which now lies quite closely around the shears 16^a (Fig. 44). Thereupon the trigger 102 makes an upward movement, grips the rear sides of the double loop between the shears 16^a and the hooked needle 112, and presses them against the label 170. At the same time the second hooked needle 81 pushes its rearwardly directed hook through the double loop and the aperture in the label, and engages the end 160 of the thread carried by the thread looper 29; whilst the loop that has been carried hitherto by the hooked needle 112 and the shears 16^a, is released, whereupon this loop is drawn taut by the tension on the thread, so that it fits closely around the knotter and the hooked needle (Fig. 45). The end 160 of the thread which during this operation has been drawn-out by the thread looper 29 and engaged by the hooked needle 81 is now by the descent of the needle 81 drawn down beside the trigger and through its loop and through the now opened tongs 139 (Figs. 3 and 17). The opening of the latter is effected by the tappet stud 140 pressing against the nose 142.

As soon as the end 160 of the thread has entered the tongs, the latter are closed by the tapped stud 140 leaving the nose 142 of the tongs, and it then makes a forward movement. At the same time the trigger moves down and releases the loop to allow the knot to be drawn tight by the tongs and the drawing out of the thread (Fig. 18). Meanwhile a hook 170' (Fig. 17) screwed

to the tongs has engaged the thread 169 and drawn it out, after the stitch loop 169 (Fig. 17) has first been released by the middle tongue 59 (Fig. 2).

5 The shears 16^a make, for gripping and severing the thread 165, the same movements as already hereinbefore described.

On the thread being severed, the tongs 139 release the end of the thread, since the nose 142 of the tongs strikes the stud 172 (Fig. 3) in its lowest position and thus opens the tongs.

What I claim is:—

1. In a stitching machine for stitching 15 sheets together with thread, the combination of a stitching plate, three needles, an upper thread looper above the stitching plate, a lower thread looper below the stitching plate, rotary shears adapted to 20 turn around a vertical axis, and to move in the direction of that axis, a horizontally movable hooked needle, a trigger for pressing the loop against the sheet to be stitched, and tongs for gripping and holding the end 25 of the thread.

2. In a stitching machine, the combination of a stitching plate, an upper thread looper above the stitching plate, a shaft 30 mounted in bearings and means for moving said shaft to and fro, a lower thread looper below the stitching plate and fixed on said shaft, a cam bar, an arm on the shaft having an antifriction roller and being pressed against the cam bar by a spring for moving 35 the lower thread looper rearwardly and forwardly, the lower thread looper having two grooves separated from each other by a pointed member for the purpose of receiving the two sides of the loop.

40 3. In a stitching machine, the combination of an upper thread looper, means for moving the upper thread looper to and fro, a stitching plate, grooves in the underside of the stitching plate, a lever mounted rotatably in the framing and carrying the 45 stitching plate, tongues engaging in said grooves and preventing the dragging of the sheet when the needle enters or returns, a bar connecting the tongues, a shaft mounted 50 on said lever, levers fixed on that shaft and carrying the bar, and means for turning the

shaft when the upper thread looper has reached the end of his course.

4. In a stitching machine, the combination of a driving shaft, a cam mounted 55 thereon, a lever actuated by the cam, a bar mounted vertically and carrying shear blades, means actuated by said lever for turning said bar, a second cam, means actuated by the second cam for lifting and lowering said bar, an arm fixed on one of the 60 shear blades, a frame and stops fixed on the frame and engaging said arm for opening and closing the shear blades when the bar is moved vertically and turned. 65

5. In a stitching machine, the combination of a shaft, a lower thread looper fixed on the shaft, a cam bar fixed on said shaft, a framing, a loop catcher rotatably mounted on the framing and resting with one end 70 on said cam bar, a bar, a hooked needle fixed on said bar, means for moving the bar lengthwise, said loop catcher having an opening, and the cam shaft holding the loop catcher in a position permitting the passage of the hooked needle through said 75 opening for catching the loop held by the lower thread looper.

6. In a stitching machine, the combination of a stitching plate, a shaft, a lower 80 thread looper fixed on said shaft, a rod, a trigger mounted on said rod, and means for raising and lowering the rod with the trigger and pressing the rear sides of the loop released by the lower thread looper against 85 the sheet to be stitched.

7. In a stitching machine, the combination of tongs for engaging the end of the loop, a framing, a lever rotatably mounted on the framing, a cam for moving said 90 lever, the tongs being disposed on the lever and having two jaws, a nose on one of the jaws, a lever pressing with one end on said nose for opening the tongs, and a cam for actuating one end of the last mentioned 95 lever.

In testimony whereof I have affixed my signature in the presence of a witness.

ULRICH BISCHOF.

Witness:

HERMANN HUBER.