April 4, 1939. D. ROTHCHILD 2,152,819

SEWING MACHINE

Filed Oct. 27, 1937 6 Sheets-Sheet 1

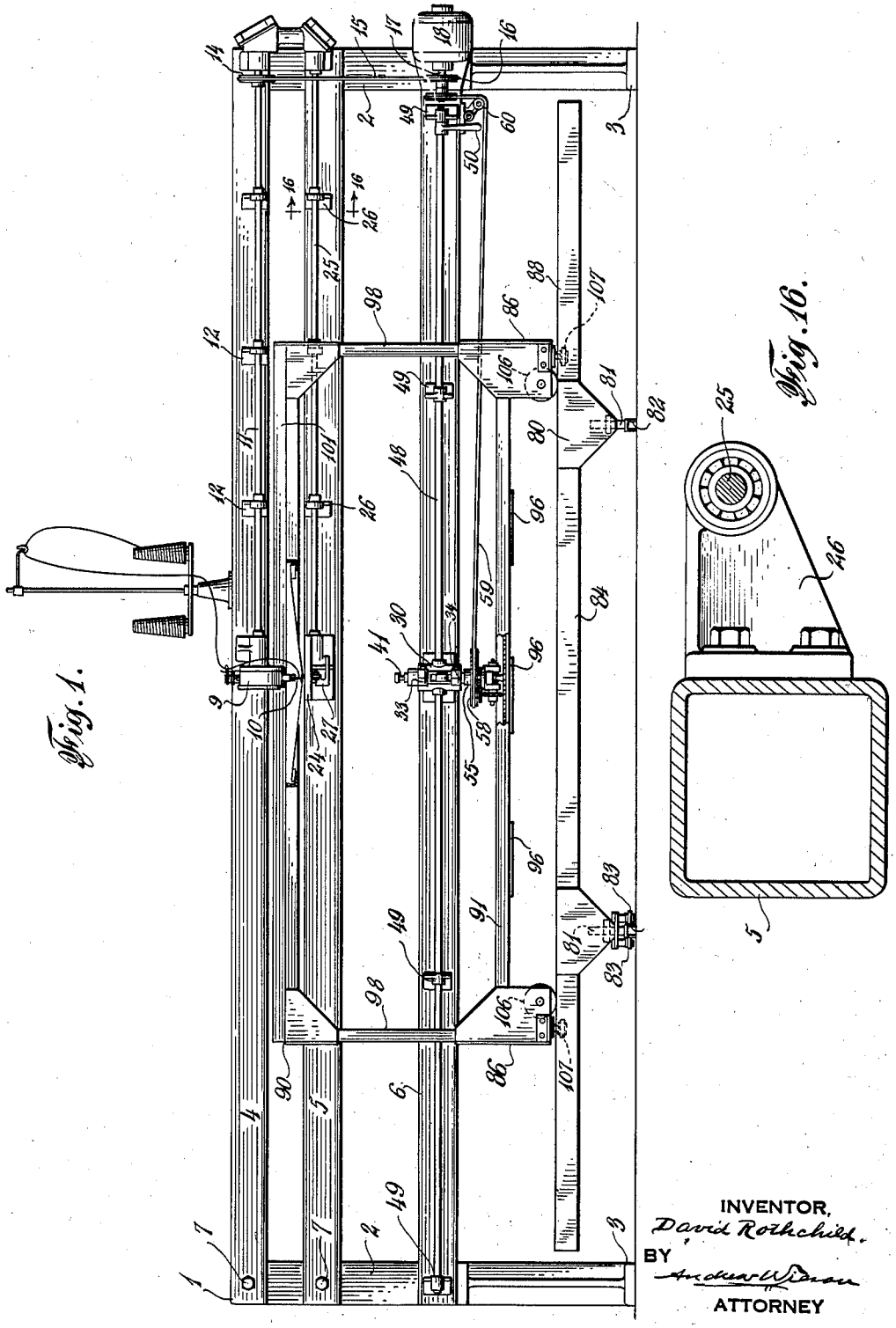


Fig. 1.

Fig. 16.

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April 4, 1939. D. ROTHCHILD 2,152,819

SEWING MACHINE

Filed Oct. 27, 1937 6 Sheets-Sheet 2

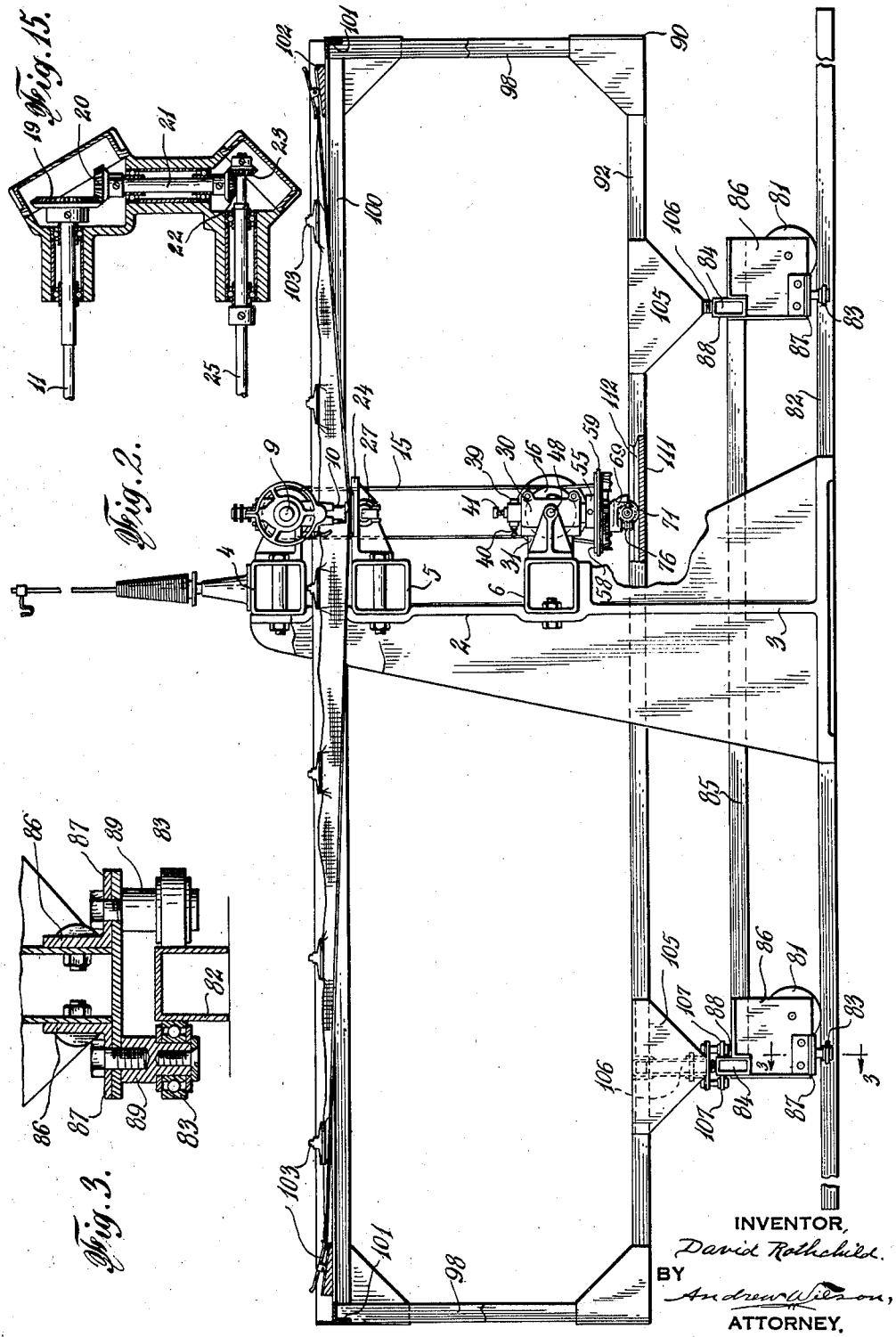


Fig. 1.

Fig. 2.

Fig. 3.

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April 4, 1939. D. ROTHCHILD 2,152,819

SEWING MACHINE

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Fig. 5.

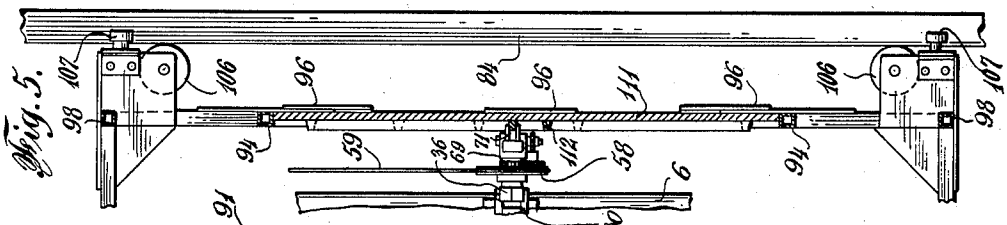
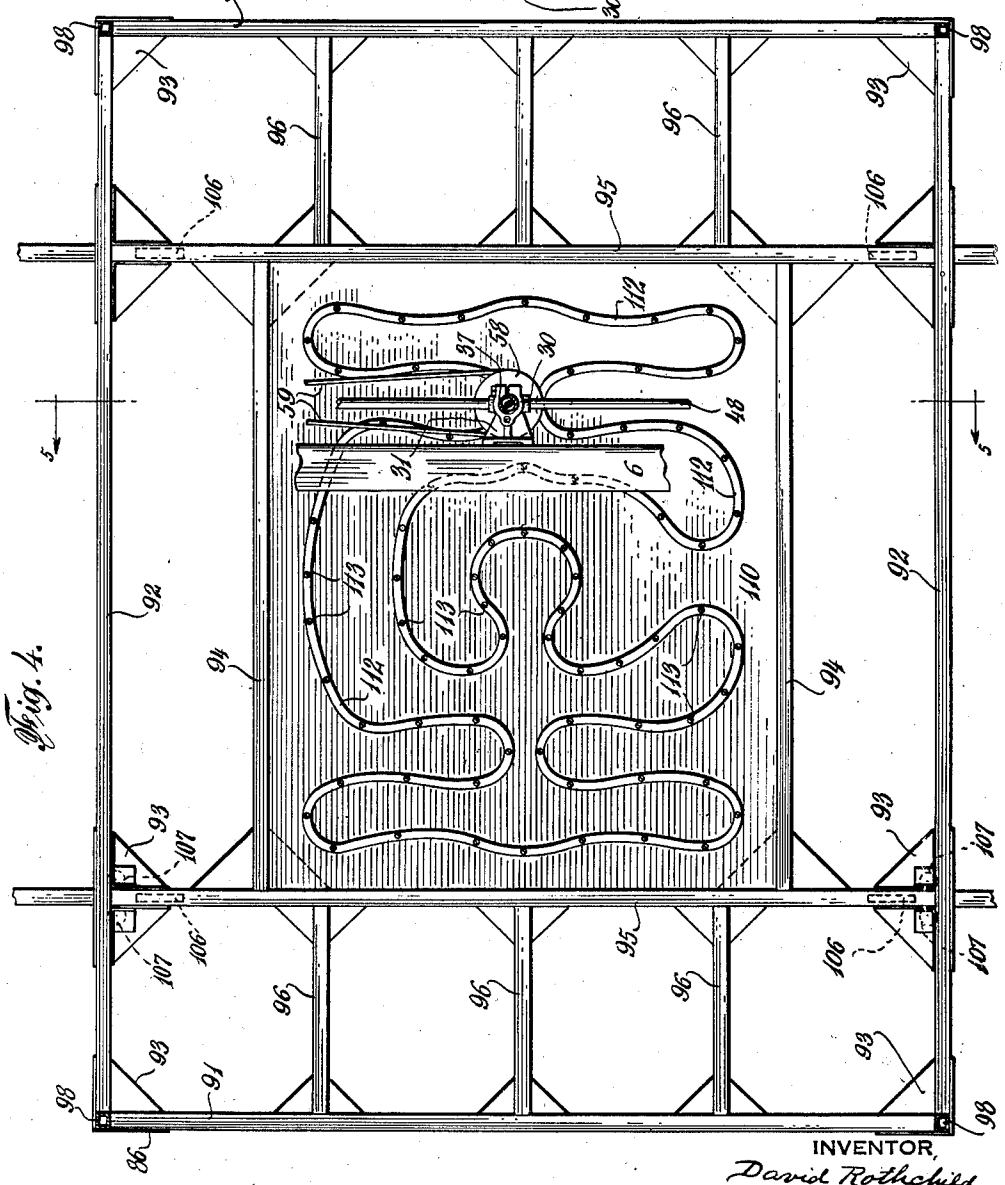


Fig. 4.



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SEWING MACHINE

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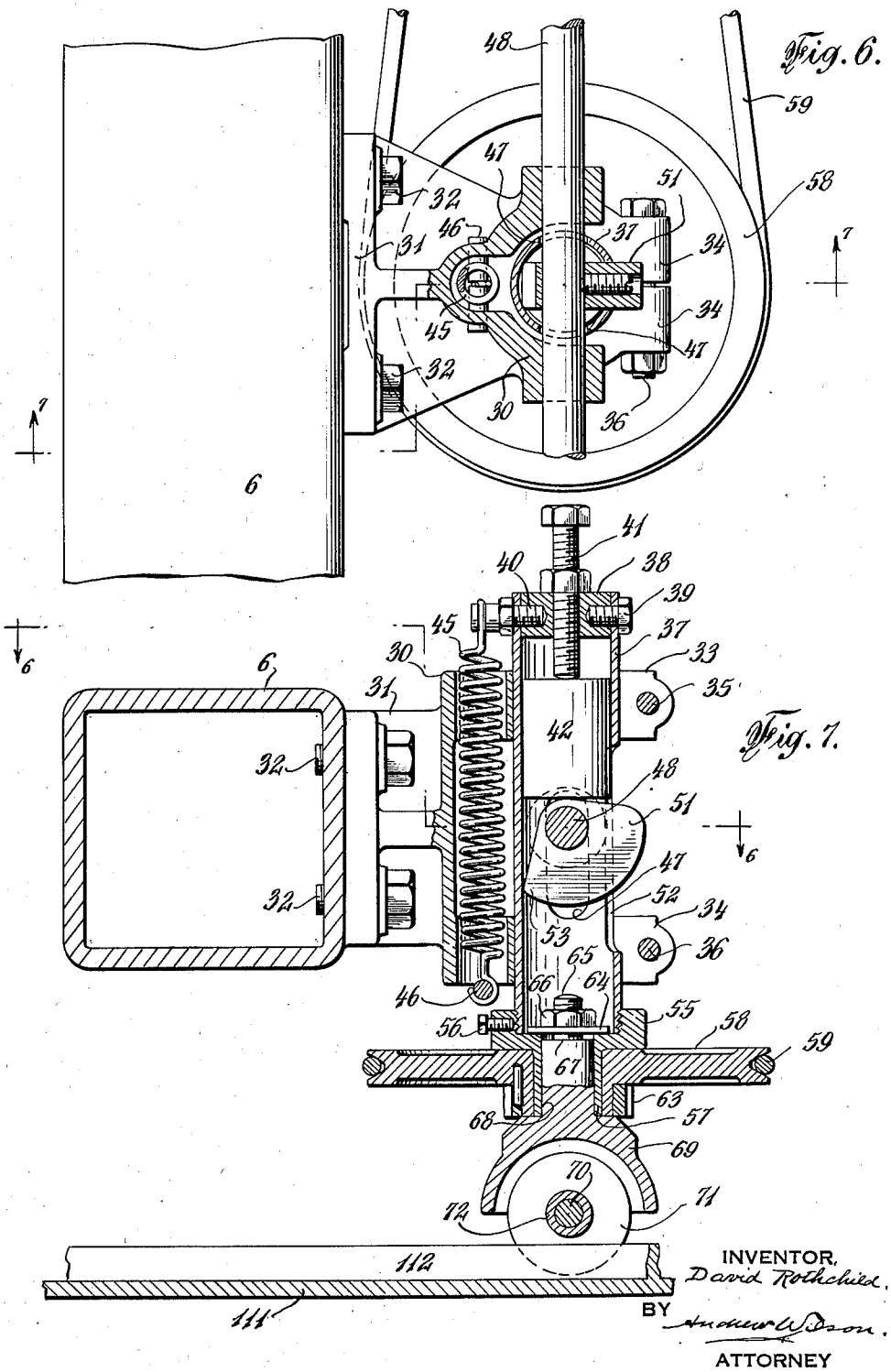


Fig. 6.

Fig. 7.

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April 4, 1939. D. ROTHCHILD 2,152,819

SEWING MACHINE

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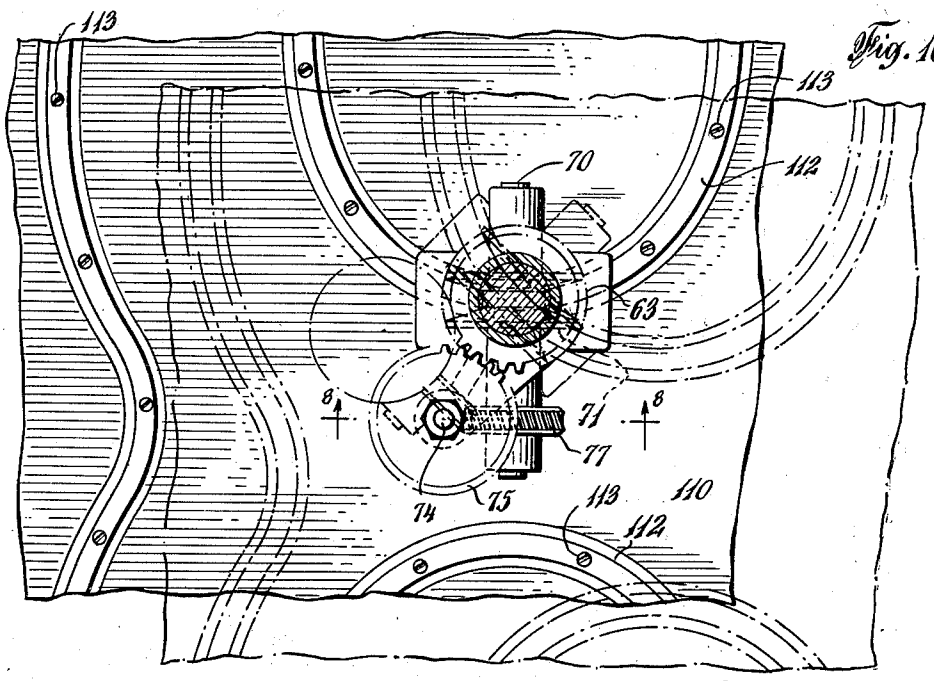


Fig. 10.

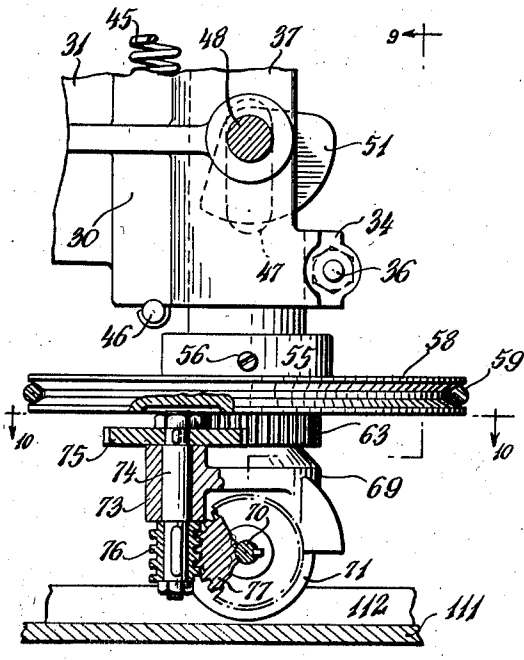


Fig. 8.

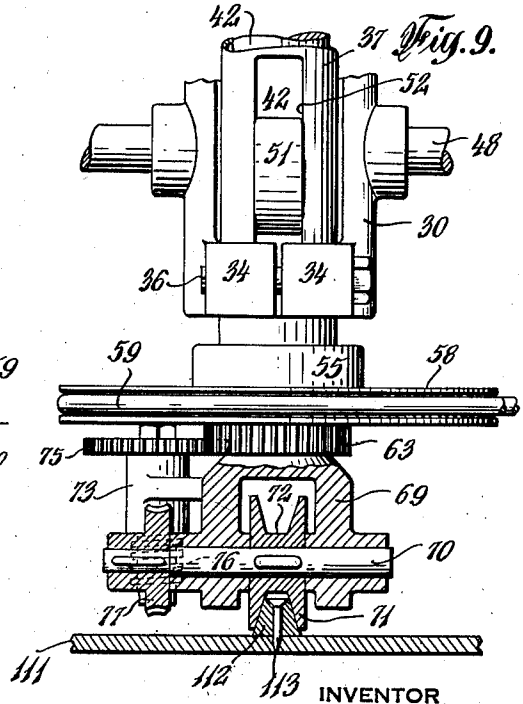


Fig. 9.

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April 4, 1939. D. ROTHCHILD 2,152,819

SEWING MACHINE

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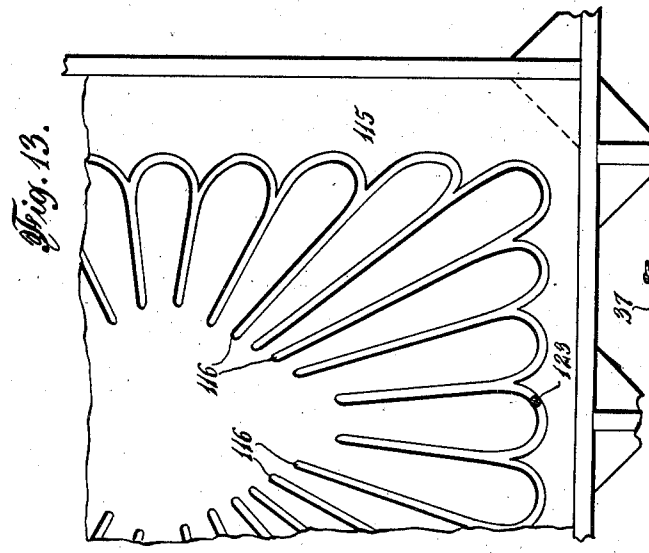


Fig. 13.

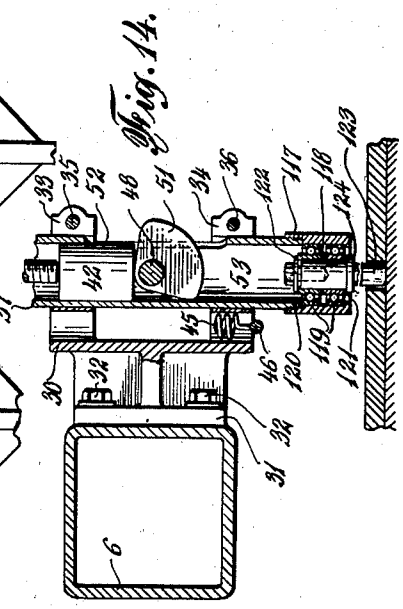


Fig. 14.

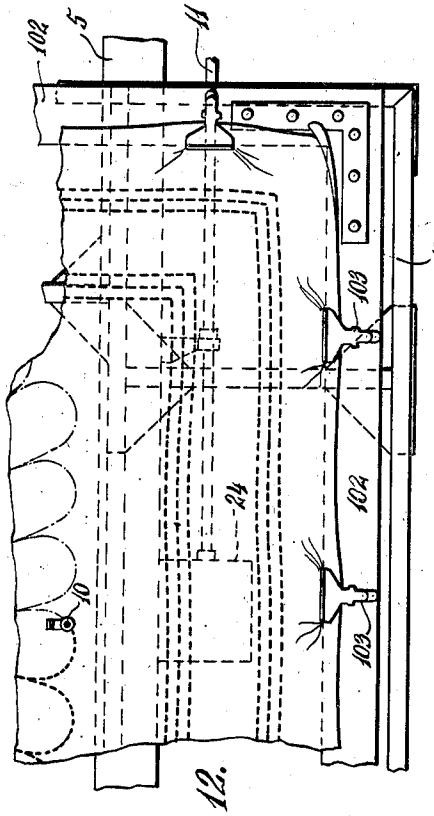


Fig. 12.

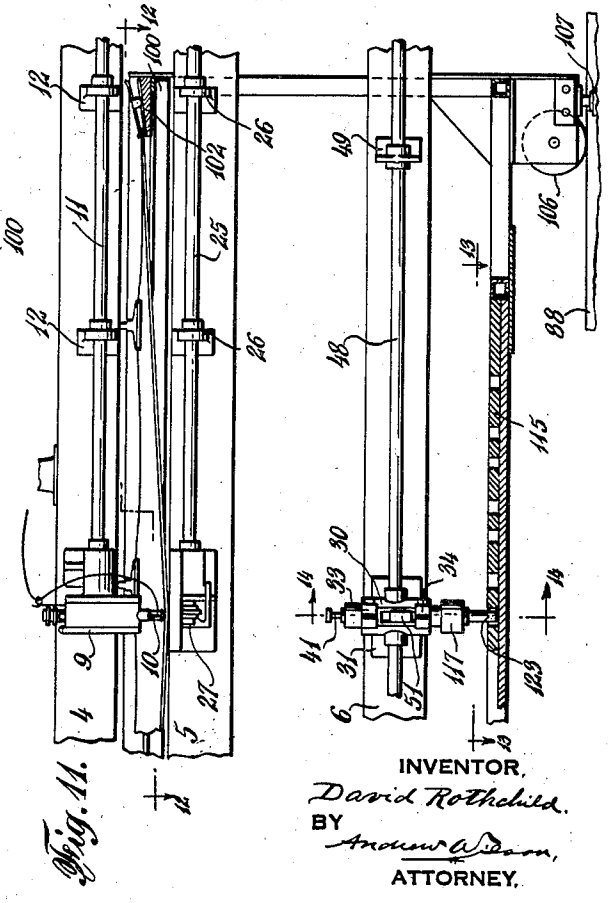


Fig. 11.

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Patented Apr. 4, 1939 2,152,819

UNITED STATES PATENT OFFICE

2,152,819

SEWING MACHINE

David Rothchild, New York, N. Y., assignor to The Palmer Brothers Company, New London, Conn., a corporation of Connecticut

Application October 27, 1937, Serial No. 171,228

5 Claims. (Cl. 112—118)

My invention relates to sewing machines which are particularly adapted for quilting together several thicknesses of material, for instance bed comfortables; but my improved machine may be employed in sewing upon various fabrics in one or more thicknesses; and in carrying out my invention I employ mechanism in which the fabric to be stitched is held stretched in a tambour frame which is moved into various positions relative to stitching mechanism having a fixed position.

In machines such as have heretofore been used for quilting comfortables, it has been customary to mount the stitching and looping mechanism on long arms projecting one above and one below the comfortable and to swing these arms manually, or automatically under the guidance of fixed pattern guides. And because of the considerable size of a bed quilt it has been necessary to make the mechanism cumbersome and heavy in order to give sufficient rigidity to the stitching and looping arms to prevent dangerous relative vibrations; and in order to provide automatic pattern guidance for the stitching and looping mechanism, heavy and often complicated cast iron pattern guides have been employed; which are not only cumbersome but are expensive to construct. Such machines are not readily convertible from automatic control to manual control.

Objects of my invention are to facilitate the operation of the relatively movable parts of the mechanism; to stabilize the relative relations of the stitching and looping mechanism; to lighten and stiffen the framework of the mechanism; to provide a simple and readily applied and changed guiding pattern; to apply certain of my improvements to an automatically guided machine or a manually guided machine; to make an automatically guided machine readily convertible into a manually guided machine and vice versa; and to obtain the other results hereinafter pointed out and claimed.

In the drawings in all the figures of which similar letters of reference designate similar parts, Fig. 1 is a front elevation of my improved machine; Fig. 2 is a side view taken as looking to the right on Fig. 1; Fig. 3 is a vertical view, partly in section, of a section of one of the tracks and the means for guiding the tambour-carrying frame along the track; Fig. 4 is a plan view of the pattern carriage, pattern and part of the pattern controlling mechanism; Fig. 5 is a sectional view of the same taken as on the line 5—5 of Fig. 4, looking to the left; Fig. 6 is a horizontal sectional view, taken on the line 6—6 of Fig. 7, of part of the mechanism for automatically controlling the movement of the pattern; Fig. 7 is a vertical sectional view of the same, taken as on the line 7—7 of Fig. 6; Fig. 8 is an elevation of the lower part of the mechanism shown in Fig. 7, the elements for driving the pattern controlling tractor, omitted in Fig. 7, being shown partially in section; Fig. 9 is a view of the same taken as looking to the left on Fig. 8; Fig. 10 is a horizontal sectional view, taken as on the line 10—10 of Fig. 8, showing an original position of the pattern and tractor in solid lines, and their changed positions, as the tractor operates, in broken lines; Fig. 11 is a front elevation of a portion of my machine modified for hand control; Fig. 12 is a view of the same taken on the line 12—12 of Fig. 11 looking down, the pattern controlling mechanism being omitted; Fig. 13 is a plan view of part of a pattern for use with hand control; Fig. 14 is a vertical sectional view on the line 14—14 of Fig. 11 looking to the right; Fig. 15 is a vertical sectional detail of the connecting gears for the stitching mechanism; Fig. 16 is a detail of one of the ball bearings used in mounting the moving parts of the mechanism.

Figs. 14 and 15 are on an enlarged scale; and Figs. 3, 6, 7, 8, 9, 10 and 16 are on a still further enlarged scale.

The principal parts of the machine are assembled in frame 1, which embodies two ends 2, 2 preferably made of practically rigid castings and provided with bases 3, 3 sufficiently elongated to afford a safe support to the frame when in an upright position. These end frames are connected by three longitudinal stretchers 4, 5, 6, which are preferably formed of stiff metal tubing, preferably rectangular in cross section, which are firmly attached to the ends 3, 3 as by bolts 7, 7. The frame 1 thus formed is practically rigid; and relative movements of its parts by springing or vibration are reduced to a minimum. This rigidity of the frame is of importance in insuring the accurate relative movements of the operating mechanisms carried by the frame. The distance between the ends of the frame is preferably sufficient to allow all parts of the fabric to be stitched to be brought under the stitching needle, by moving the fabric to and fro within the frame.

On the stretcher 4 is fixedly mounted a sewing machine head 9 carrying the mechanism for the reciprocating needle 10, such mechanism not being shown in detail as no novelty is claimed in its construction. The needle mechanism is actuated by a shaft 11 mounted in suitable bearings such

as 12, 12, preferably embodying ball bearings such as are shown in the enlarged detail of Fig. 16, which ball bearings practically eliminate the use of oil or grease, and avoid the danger of forming grease spots, by drippings, on the fabric. The shaft 11 carries a pulley 14 over which travels a belt 15 driven by a pulley 16 on the shaft 17 of an electric motor 18 mounted upon the frame of the machine.

Through bevelled gears 19, 20, 22 and 23, and shaft 21 shown in Fig. 15, the shaft 11 is connected with a shaft 25 carried upon the stretcher 5, as by roller bearings 26, 26, similar to the roller bearings 12, 12.

This shaft 25 actuates the looper mechanism 27, below table 24, which cooperates with the needle 10 in the well known manner, the details not being shown as no invention is claimed in these stitch forming elements. The bevelled gearing illustrated gives the shaft 25 a movement of three to one relative to the shaft 11. But it is to be understood that the relative movements of these shafts may be regulated by modifying the ratios of the bevelled gears so as to obtain whatever relative speeds of the needle and looper may be most desirable in practice.

By mounting the needle mechanism in this way, upon separate, rigid carrying elements, variations in their relative positions due to shock, vibration or distortion of their mountings during the operation of the machine are eliminated; and a normal cooperation between the stitch forming mechanisms is insured.

Upon the stretcher 6 is mounted a pattern controlling unit 30, the function of which is to move the pattern, and through it the tambour frame, into the desired successive positions below the needle. This unit 30 is mounted in a bracket 31 secured, as by bolts 32, 32, to the stretcher 6, and provided with two pairs of arms 33, 33 and 34, 34, respectively, adjustably connected by bolts 35 and 36. Within these arms slides a tubular member 37, in the upper end of which is a head 38 held in place by bolts 39 and 40, the head being tapped to receive an adjusting screw 41 the end of which extends down within the tube 37 and rests upon a plunger 42 reciprocable within the tube.

A tension spring 45 extends from the bolt 40 down through openings in the bracket 31, and is anchored at its lower end as at 46 below the bracket. This tension spring normally tends to draw the tube 37 down through the bracket. The tube 37 has transverse slots 47, 47 passing through its sides; and through these slots runs a shaft 48 carried by bearings 49, 49 mounted on the stretcher 6, the shaft 48 being provided with a handle 50 by which it may be partially rotated to and fro. On the shaft 48 is rigidly mounted a cam 51 one edge of which projects out through a slot 52 in the tube 37; and the cam heel 53 rocks back against the inside of the tube 37. By turning the shaft 48 counterclockwise the cam 51 will raise the tube 37 against the tension of the spring 45, the normal position of the tube relative to the cam being determined by the adjustment of the plunger 42 within the tube. To the lower end of the tube is secured a flanged collar 55, as by threading and tap screw 56; and this flanged collar has a hub 57 on which revolves a pulley 58 around which runs a belt 59 travelling over idlers 60, 60 and then over a pulley 61 on the shaft of the motor 18. A gear 63 is keyed to the pulley 58 so as to rotate with it. A washer or similar element 64 rests upon an internal flange of the collar 55 and through it passes the threaded shank 65 of a foot element which is secured to the washer 64 as by nuts 66 and 67.

The shank 65 is enlarged in the form of a cylinder 68, which is rotatable in a bearing within the collar 55, and expands into a foot 69 in which is journalled a shaft 70 having keyed thereon a traction wheel 71 having an inwardly tapered groove 72 in its outer edge.

The foot 69 has an extension 73 through which passes a shaft 74 to the upper end of which is keyed a gear 75 meshing with the gear 63, and carrying on its lower end a worm 76 meshing with a worm gear 77 keyed on the shaft 70, the ratio of this chain of gears is such that its movement under the impulse of the pulley 58 will turn the traction wheel 71 approximately the proper distance of the length of one stitch, with each stitch made by the sewing machine mechanism. The vertical axis of the guide unit 30 is fixed in position in line below the stitching mechanism, this relative position being always maintained.

I will now describe the pattern carrying mechanism which embodies two relatively movable frames by means of which the tambour frame can be shifted into any desired position relative to the needle.

A lower frame 80 is carried on rollers 81, 81 running on tracks 82, 82 placed between the ends 2, 2 of the frame of the machine. The rollers 81, 81 are kept in place on the tracks 82, 82 by guide rollers 83, 83 carried by plates 86, 86 and engaging on opposite sides of the tracks 82, 82 by flanges 87, 87 provided with bearings 89, 89 in which the rollers are mounted. This frame 80 embraces two parallel bars 84, 84 connected by transverse bars 85, 85 all preferably formed of angle irons and provided near their junction with plates 86, 86 which furnish supports for the carrying rollers 81, 81, the plates 86, 86 having extensions 87, 87 to carry the rollers 81, 81 and 83, 83. This lower frame is also stiffened at its corners with corner plates similar to the corner plates used for stiffening the upper frame hereinafter described.

The object of this arrangement is to secure a light and comparatively stiff frame of simple construction travelling under the machine on fixed tracks.

The members 84, 84 of this frame constitute tracks upon which the upper frame travels. This upper frame, designated as a whole as 90, is preferably rectangular in form and is preferably built up of angle bars 91, 91 and 92, 92 reinforced at their corners by plates as 93, 93 and intermediately by transverse bars 94, 94 and 95, 95 and by braces 96, 96 the junctions between the various bars of the frame being reinforced by corner plates similar to 93, 93, as shown in the drawings.

The space between the bars 94, 94 and 95, 95 is provided at its bottom with transverse strips 96, 96 which form bottom supports within the space surrounded by the bars 94, 94 and 95, 95. From the four corners of the frame 90 supports 98, 98 extend upward to carry the tambour frame, the uprights being connected by longitudinal angle bars 100, 100 and transverse angle bars 101, 101, joined at the corners on which the tambour frame, preferably of wood, 102, is mounted, being provided with suitable clamps 103, 103 for holding the material to be stitched. The various corners of this framework are preferably reinforced, as by angle plates similar to 93, 93, so as to give considerable stiffness to the

framework which is, nevertheless, light, and easily movable from one position into another. From the bars 91, 91 plates forming legs 105, 105 extend down to carry rollers 106, 106 travelling on the tracks 88, 88 and held to duty by side guide rollers 107, 107 similar to the rollers 83, 83. Preferably the various rollers in this assembly are provided with ball bearings so as to minimize friction and avoid the use of oil and grease around the mechanism.

The result of this arrangement is that the tambour frame is mounted upon light, stiff carriages movable at right angles to each other so that universal movements of the tambour frame in a horizontal plane may be obtained with the expenditure of very little energy.

Within the space between the bars 94, 94 and 95, 95 is placed the guide pattern 110, which is preferably formed of a wooden panel 111 upon which a raised pattern is formed.

As it is desirable to change the patterns used on machines of this class frequently, it becomes important to use control patterns which are both inexpensive to produce and readily changeable as to design, as well as being comparatively light, so as to minimize the load upon the carrying frame.

I therefore employ a flexible element, which may be bent into the desired pattern and fastened detachably to the wooden panel. For such a purpose I have found a flexible band of rubber, or rubber and fabric, sufficiently stiff to retain its cross sectional shape while in use, to be suitable. Such a band 112 is shown in cross section in Fig. 9, as having the sides tapering toward the top, which is preferably flattened. Such a band may be readily fastened to the wooden panel, as by nails 113, 113, which will give it sufficient stability to stand up under the action of the pattern moving mechanism. That action is as follows:—The grooved wheel 71 is raised by turning the shaft 48 anticlockwise, causing the cam 51 to push up the plunger 42 and the tube 37 and its attachments. The design is then moved, by the relative movements of the carriages, to bring the point at which it is desired to commence the stitching of the design upon a fabric held in the tambour frame in position below the needle. The grooved wheel 71 is then lowered by reversing the movement of the cam 51 so that the wheel straddles the pattern band as shown in Fig. 9. The motor 18 is then started, causing the wheel 71 to turn forward on the band 112 on which it can be urged to duty by turning down the adjustment screw 41 to insure a pressure which will prevent the wheel from jumping off the band and will also keep the wheel from slipping on the band. The drag of the wheel 71 on the pattern band 112 will draw the band under and past the wheel, thereby moving the pattern carrying frame and the tambour frame to the same extent and in the same direction, so that the movement of the fabric in the tambour frame will correspond with that of the pattern.

Simultaneously with the movement of the wheel 71 the stitching mechanism will come into operation and a stitch will be formed and the needle withdrawn and the fabric moved forward the appropriate distance for a stitch before the needle again descends. The pattern shifting and the stitching may then proceed until the desired amount of stitching has been done. It will be obvious that the machine may be stopped and the wheel 71 raised free of the pattern and that the pattern may be shifted and the wheel lowered to engage it in a different position if that becomes desirable. But in the pattern design which I have illustrated in Fig. 4 of the drawings the design is a continuous one and may be completely reproduced without disconnecting the wheel from the pattern guide. The relative movements of the mechanism connected with the wheel 71 and of the pattern are illustrated in Fig. 10 in which the full lines show an initial position of the pattern and the wheel and attachments, and the broken lines show the relative changes of position as the wheel turns and draws the pattern along beneath it.

Under certain conditions it may be desirable to operate a machine of this general construction manually instead of automatically. In that case the pattern panel 111 is lifted out of the frame and a different type of pattern guide, for instance 115, having the pattern formed of grooves 116, 116 in its surface, may be substituted. The collar 55 is then screwed off of the lower end of the tube 37 and is replaced by a socket element 117 carrying within it a pattern controller 118, rotatable in roller bearings 119, 119, held within the socket between the lower end 120 of the tube 37 and a flange 121 on the lower end of the socket element 117, the controller 118 being held in place within the ball bearings by a washer 122 secured as by a bolt to its upper end and by a flange 124 on its lower end. The controller 118 is rotatable in its ball bearings as its lower end 123 is moved along in the groove of the pattern, thereby minimizing friction and wear.

The belt 59 is thrown off the pulley 61 when the collar 55 is removed from the tube 37. If now the stitching mechanism is thrown into operation the pattern carrying frame may be moved by hand so as to cause the groove of the pattern to move past the lower end of the plunger 118 and to so change the position of the fabric in the tambour frame as to progressively follow the movements of the pattern. To do this satisfactorily the frame must be light and easily moved by the operator, friction being minimized so far as possible and weight reduced, while the necessary stiffness of the pattern carrying framework is retained. In both these automatic and manually controlled arrangements the pattern is moved by mechanism of its own independently of the stitching mechanism so that any shocks or jars in the pattern moving mechanism will not be directly transmitted to the stitching mechanism so as to endanger the accurate functioning of its parts.

It will be seen that by the use of my improvements I obtain mechanism in which the danger of distorting the relative positions of the needle and the looper mechanisms through shocks, flexings or the like is practically eliminated both by the rigid, but comparatively light, construction of the framework of the machine, and by constructing and mounting the apparatus for carrying the tambour frame and the pattern as a unit independent of the main frame of the machine; so that jars, shocks or movements of that unit will not affect the stitching mechanism.

The fact that the stitching mechanisms are carried midway of stiff bars supported at each end by the uprights of the frame greatly add to the stability of the stitching mechanism; particularly as compared with constructions in which the needle mechanism and the looper mechanism are carried at the extremities of long

arms reaching out from and movable on or with a common base.

This element of stability is also present in a similar way in the mounting of the pattern control mechanism, which is fixed as a unit in its relation to the stiff frame of the machine and operates with a high degree of smoothness and accuracy in drawing the pattern past it.

The use of a flexible and readily attachable and detachable element, substantially in the form of a continuous band, which may be bent into a large variety of designs, as taste may dictate, affords a simple, inexpensive and efficient method of employing a large variety of different designs in the operation of the machine, by simply releasing the band and rearranging it in different forms on the pattern platen.

Furthermore the capacity of the apparatus for being readily changed from an automatic control of the pattern to a manual control is of considerable practical utility. For it requires simply the substitution of a slightly different type of pattern and the replacement of one pattern control guide by another to permit the mechanism to be used for different types of pattern, for instance embodying points and the like, which might not be as readily reproduced with the flexible band type of control pattern. By this means it is possible to stitch a master design with the use of the automatic control and then to embellish it by manual control with details of a different type of design. The light construction of the tambour frame controlling mechanism enables an operator to move the frame with facility and with but little effort. This is something which has not heretofore been possible so far as I am aware in machines of the class to which my invention is directed.

I wish it to be understood, however, that the particular embodiment of my improvements which I have mentioned and described is to be considered as typical and not as exclusive; for such construction might be varied, as by the use of mechanical equivalents and the like, without departing from the spirit of my invention or the scope of my claims.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is:

1. The combination, in a sewing machine, of fixed stitching means, a relatively movable tambour frame, a pattern, movable with the tambour frame, embodying a platen having a flexible, non-metallic raised design element thereupon and means, embodying a driven wheel provided with a circumferential, closed groove straddling the design element longitudinally and engaging frictionally therewith for moving it and the tambour frame in the lines of the design.

2. The combination in a sewing machine, provided with a tambour frame, and a control pattern embodying a platen having a raised, non-metallic design thereupon of means for moving the tambour frame control pattern, provided with a fixed actuating unit embodying a swiveled foot carrying a driven tractor wheel having an inwardly contracting, circumferential, closed groove therein frictionally engaging with said pattern by straddling the non-metallic element thereupon, and means for driving said tractor wheel to draw the pattern past it in the lines of the pattern design.

3. The combination, in a sewing machine, of stitching means, a tambour frame movable relative to the stitching means and provided with a pattern platen embodying a flexible, non-metallic, raised design with inwardly converging sides, and means embodying a wheel provided with a closed circumferential groove having inwardly converging sides straddling and frictionally engaging the design element for moving it and the tambour frame in the lines of the design.

4. The combination, in a sewing machine, of stitching means, a tambour frame movable relative thereto, and carrying a raised governing platen design flexible, non-metallic rib, a pattern tractor provided with unitary driving means for frictionally engaging the design rib on both sides with a downward and inward wedging contact, and means to drive the tractor to draw the pattern past it in the lines of the design.

5. The combination, in a sewing machine, of fixed stitching means, a relatively movable tambour frame, a pattern, movable with the tambour frame, embodying a platen having a flexible and compressible raised design element of substantially uniform size and cross section thereupon, and means yieldably and frictionally engaging with said design element for moving it and the tambour frame in the lines of the design.

DAVID ROTHCHILD.