Sept. 3, 1940. W. MONTGOMERY 2,213,589

CANDLEWICK TUFTING MACHINE

Original Filed Feb. 24, 1937 6 Sheets-Sheet 1

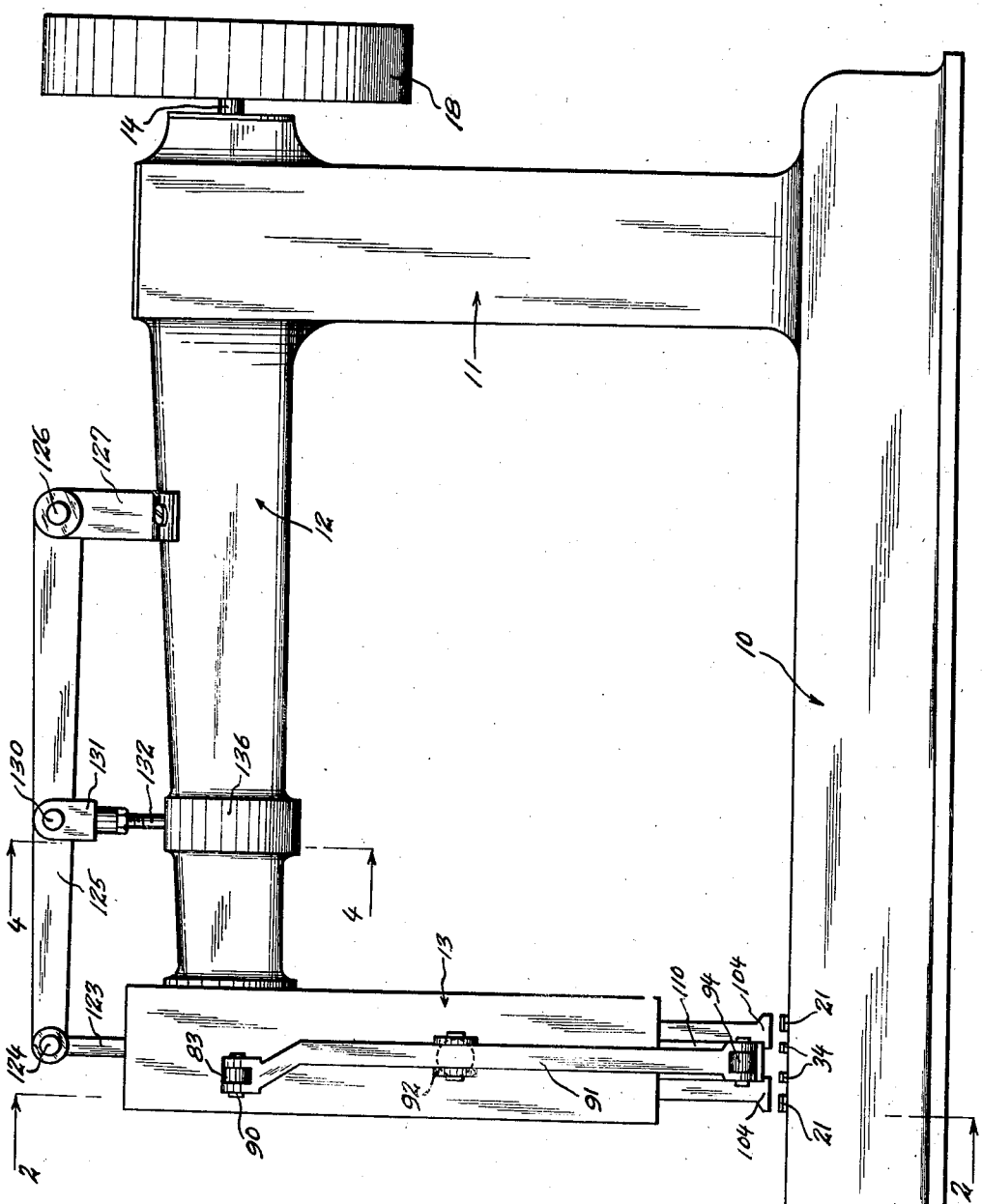


FIG. 1.

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CANDLEWICK TUFTING MACHINE

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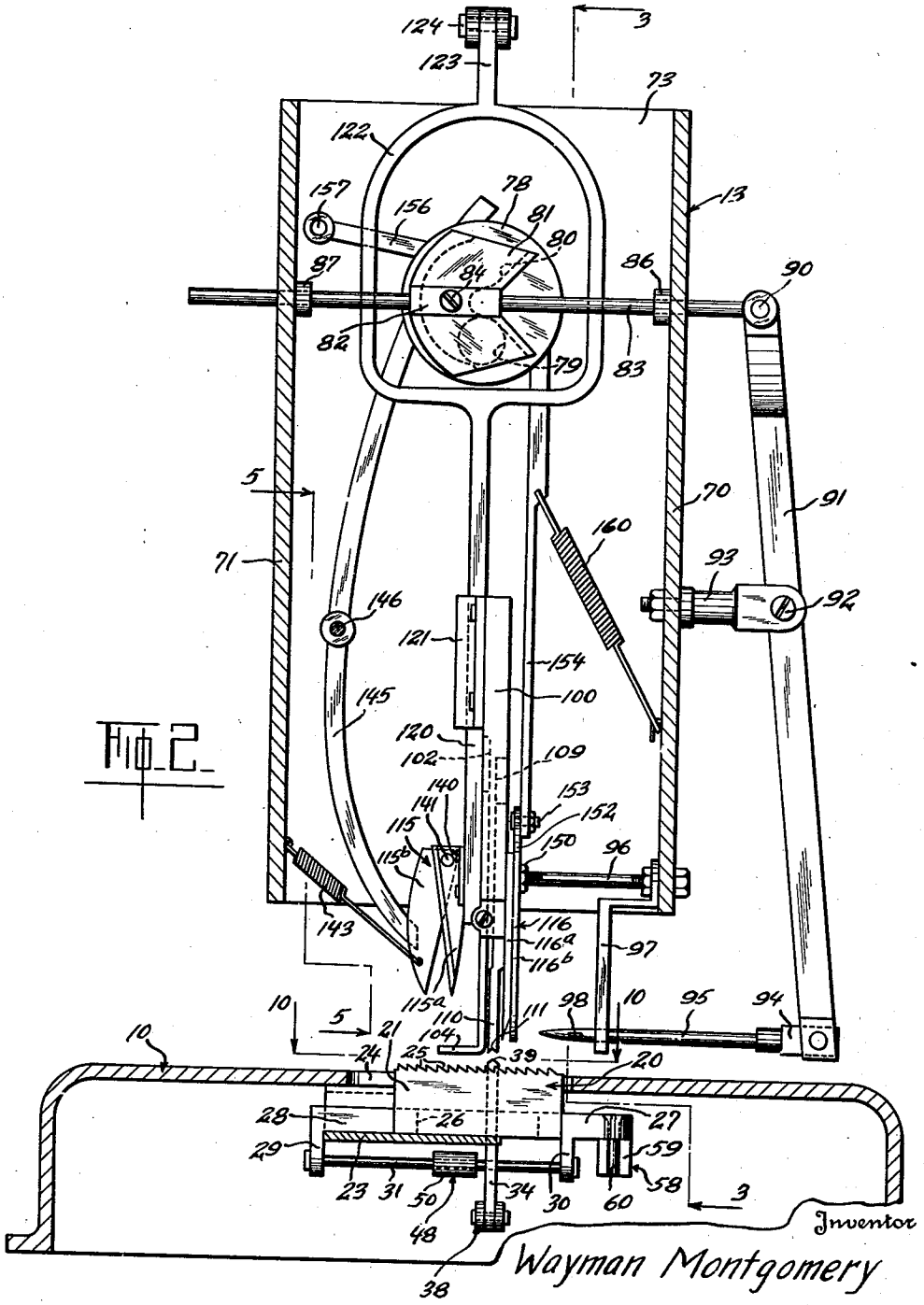


FIG. 2.

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CANDLEWICK TUFTING MACHINE

Original Filed Feb. 24, 1937 6 Sheets-Sheet 3

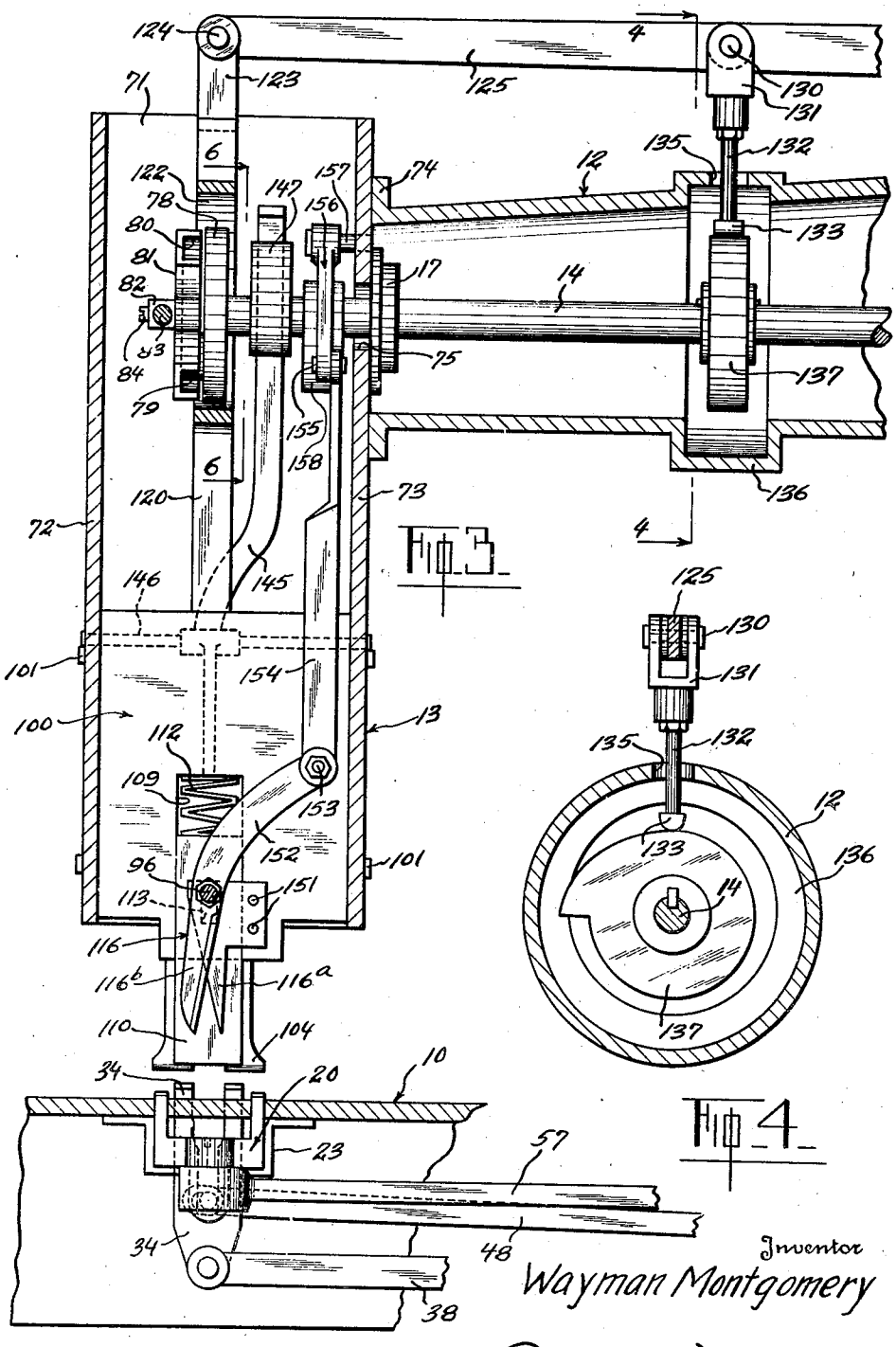


FIG 3

FIG 4

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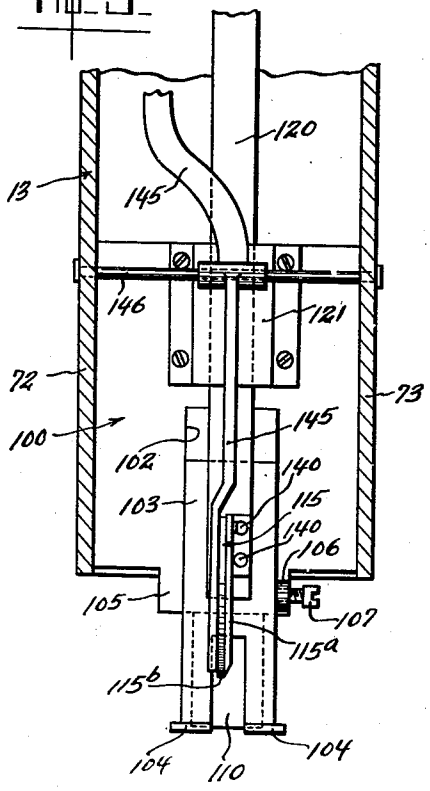
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CANDLEWICK TUFTING MACHINE

Original Filed Feb. 24, 1937 6 Sheets-Sheet 4

FIG. 5



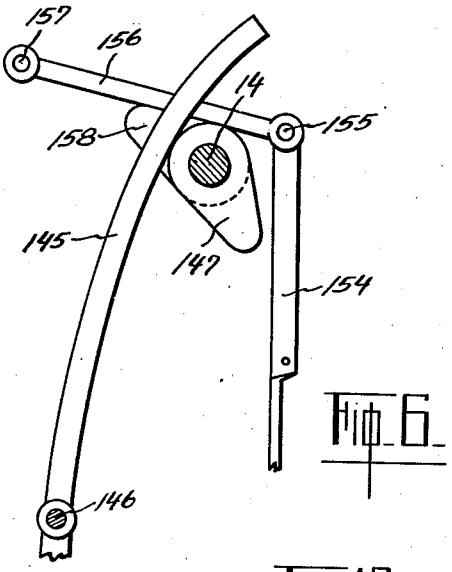


FIG. 6

FIG. 13

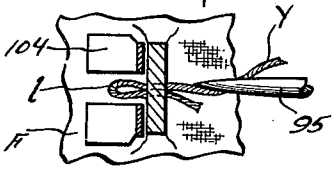
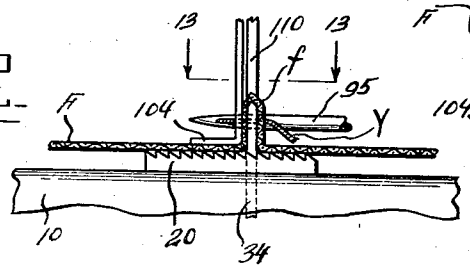


FIG. 12



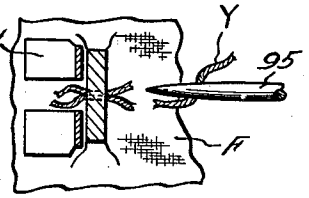


FIG. 14

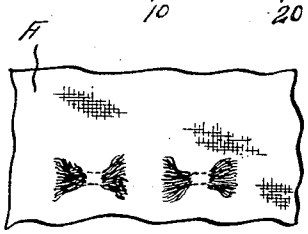


FIG. 15

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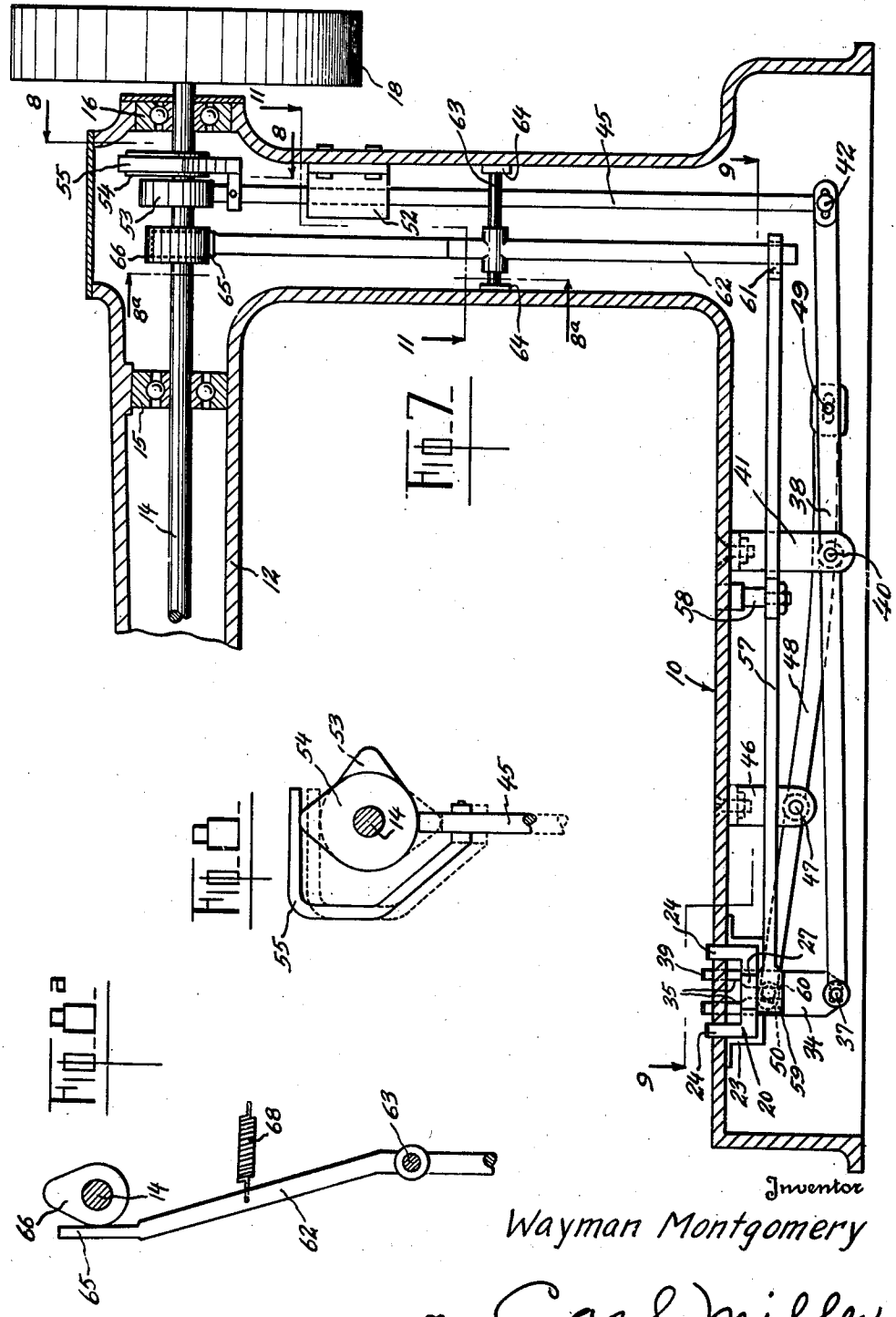


Fig. 7

Fig. 8

Fig. 8a

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CANDLEWICK TUFTING MACHINE

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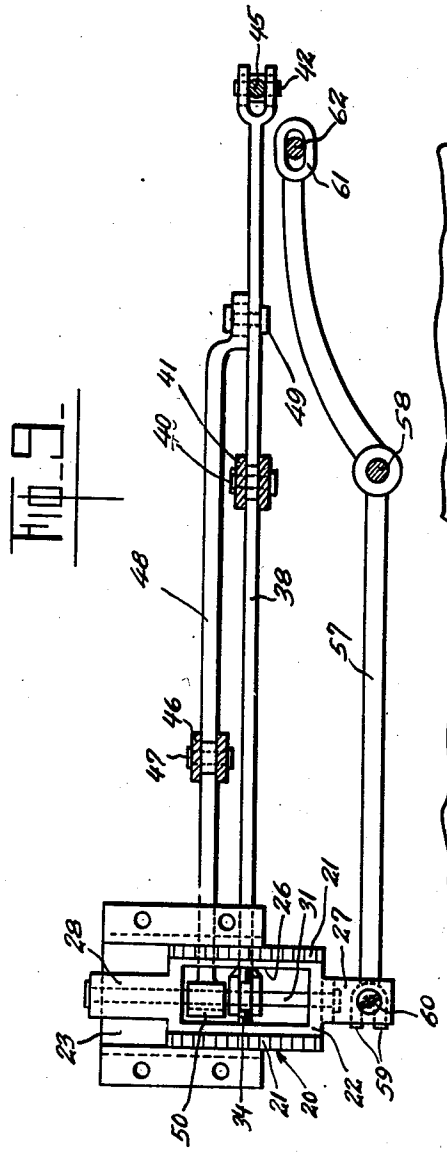


FIG. 9

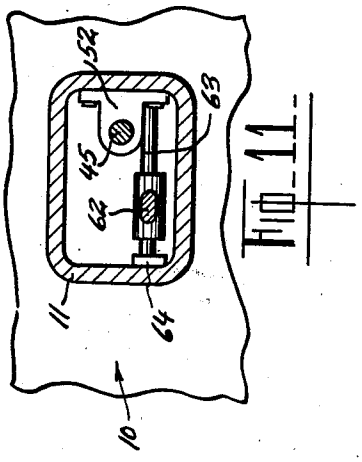


FIG. 11

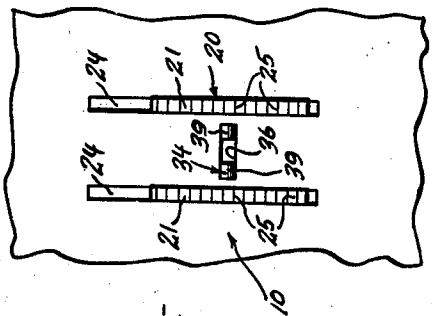


FIG. 10

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Patented Sept. 3, 1940 2,213,589

UNITED STATES PATENT OFFICE

2,213,589

CANDLEWICK TUFTING MACHINE

Wayman Montgomery, Sugar Valley, Ga., assignor of one-half to J. M. Muse

Application February 24, 1937, Serial No. 127,442
Renewed February 1, 1940

1 Claim. (Cl. 112—79)

This invention relates to sewing machines and particularly to apparatus for and method of producing tufted articles such as "candlewick" bedspreads and the like, wherein a plain or woven fabric is decorated by tufts along predetermined lines in the form of design on the fabric.

In the making of "candlewick" spreads, the decorative tuftings are made by inserting the yarn or the like with a needle and cutting the yarn comprising the stitches on one side of the spread to form ends which when unraveled form the tufts. The design of the spread is defined by rows of such tufts which may be formed of single stitches spaced apart or from groups of stitches spaced apart or variations thereof.

The principal object of this invention is to provide a sewing apparatus or means for and the method of making candlewick bedspreads or the like of the character mentioned above, which sewing apparatus constitutes a sewing machine designed solely to first provide a single loop stitch through a folded portion of the fabric which is formed and actuated by a novel form of feeding mechanism and thereafter by a cutting mechanism to sever the loop as well as to clip the yarn to form a single tuft, this operation being repeated by the sewing machine at a uniform speed to provide a line or row of spaced tufts.

The method embodied in the foregoing object is accomplished by simultaneously feeding the fabric across the sewing machine and forming a vertical fold therein, causing the needle with the yarn threaded therethrough to horizontally pierce the fold of the fabric and to withdraw to form a loop on one side of the fold, severing the loop on said one side of the fold, and clipping the yarn attached to the needle on the other side of the fold, and unfolding the fold and feeding the fabric forwardly to repeat the same series of operations on the next stitch; the folding of the fabric providing the spaces between the stitches or tufts.

The mechanism embodying the invention to perform the above method consists of a feeding and folding mechanism, a sewing or stitching mechanism and a stitch cutting mechanism, and it is accordingly another object of this invention to provide for synchronous movements of the foregoing means so that the feeding, stitching and cutting operations and feeding of the fabric across the machine is continuous.

The foregoing and other objects and advantages of the invention and the preferred mechanism for accomplishing the same will be better understood and will be pointed out in detail during the course of the following description of the accompanying drawings, wherein:

Figure 1 is a front elevational view of the sewing machine.

Figure 2 is a vertical sectional view through the head of the machine taken on line 2—2, Figure 1, in the direction of the arrows.

Figure 3 is a vertical sectional view through the head and a portion of the framework of the machine taken on line 3—3, Figure 2, in the direction of the arrows.

Figure 4 is a detail sectional view through the neck of the framework of the machine taken on line 4—4, Fig. 1, showing the operating cam on the main shaft for controlling the loop severing part of the cutting mechanism.

Figure 5 is a fragmentary view taken on line 5—5, Figure 2, in the direction of the arrows showing in front elevation the presser foot and a portion of the cutting mechanism.

Figure 6 is a detail view of the cam operating mechanism taken on line 6—6, Figure 3, in the direction of the arrows.

Figure 7 is a fragmentary vertical sectional view through the base and pedestal of the machine showing the operating lever mechanism.

Figures 8 and 8*a* are respectively detail sectional views taken on lines 8—8, and 8*a*—8*a*, of Figure 7.

Figure 9 shows in plan the feed mechanism and operating levers therefor, taken on line 9—9, Figure 7, in the direction of the arrows.

Figure 10 is a fragmentary plan view of the portion of the feed mechanism projecting above the bed of the machine, taken on line 10—10, Figure 2.

Figure 11 is a transverse sectional view through the pedestal of the machine taken on line 11—11, Figure 7.

Figures 12, 13 and 14 show various steps in the forming and cutting of the stitch to form the tuft.

Figure 15 shows a pair of tufts as formed by the machine.

Referring to the drawings, the entire machine is shown in front elevation in Figure 1, and comprises a bed or base 10, an upright pedestal 11 at one end thereof provided with an overhanging cantilever extension or neck 12 to the free end of which is connected the sewing machine head 13. The bed 10, pedestal 11 and neck 12 are made of any suitable metal and are cast hollow as one integral body or in separate parts to be joined together, in the manner well known. Preferably both the

pedestal 11 and the neck 12 are arranged in the longitudinal vertical center plane of the bed 10.

Arranged axially within the neck 12 is a drive shaft 14 supported at its rear end within the anti-friction bearings 15 and 16 at the rear of the neck 12 and located one on each side of the pedestal 11, see Figure 7; and at its forward end within the anti-friction bearing 17 positioned at the forward end of the neck, see Figure 3. The rear end of the drive shaft 14 extends outwardly of the bearing 16 and carries a pulley 18 which is to be connected to a source of power by a belt drive (not shown). It is to be understood that the drive shaft 14 may be operated by an electric motor suitably arranged on the machine and constituting a part thereof in the manner well known. The method or means employed for operating the drive shaft 14 forms no part of this invention.

To produce the contemplated form of tuft there is embodied within the machine three distinct mechanisms, namely the feeding mechanism, the stitching mechanism and the stitch-cutting mechanism each of which functions in a predetermined sequence for forming each tuft, the operations of the various mechanisms having synchronous movements so that the stitching, stitch-cutting and feeding of the cloth across the machine bed is continuous.

Feeding mechanism

Adjacent the end of the bed 10 opposite the pedestal 11 is arranged a U-shaped feed element 20 comprising upright gripping arms 21 and a base 22. The feed element 20 is slidably supported within a suitable channel shaped bracket 23 attached in a desired manner to the underside of the bed 10, see Figure 7. Each gripping arm 21 projects through a slot 24 in the bed 10, for a distance substantially equal to the depth of the serrations 25 formed on the ends of said gripping arms. The slots 24 are of a greater length than the length of the gripping arms 21, and viewing Figure 10 extend forwardly of the gripping arms to accommodate the horizontal reciprocatory movement of the feed element 20.

The base 22 of the gripping element 20 is slotted for substantially the entire extent thereof to define an opening 26 for a purpose to be hereinafter described, and is formed with oppositely directed extensions 27 and 28, the extension 28 terminating in a downwardly directed ear 29. A similar ear 30 is formed on the extension 27 at its inner end. Bridging the ears 29 and 30 is a rod 31, that is disposed, see Figure 2, beneath the bottom of the bracket 23.

Operating within the opening 26 of the base 22 is a vertical feed-gauge 34, slotted as at 35 at its upper end portion to accommodate the rod 31; said upper end portion projecting through a longitudinal slot 36 in the bed 10, centrally between the transverse slots 24, as clearly shown in Figure 10. The lower end of the feed-gauge 34 is pivotally attached as at 37 to one end of a rock lever 38. The upper edges of the slotted end of the feed-gauge 34 are beveled as at 39 to define an inverted V for a purpose to be hereinafter described.

The main rock lever 38 is fulcrumed at at 40 to a bracket 41 attached to the underside of the bed 10, and at its other end is provided with a pivotal pin and slot connection 42 to a vertically reciprocating push rod 45. Arranged forwardly of the bracket 41 and to one side thereof is a similar bracket 46 to which is fulcrumed as at 47 an auxiliary rock lever 48, one end of which is pivotally connected as at 49 to the main rock lever 38 rearwardly of its fulcrum 40. The other end of the auxiliary rock lever 48 terminates in a slotted eye 50 for connection with the rod 31.

The push rod 45 is positioned within the pedestal 11 and is guided in its movements by a guide bracket 52 attached to the wall of the pedestal 11, the upper end of the push rod 45 having riding engagement with a cam 53, mounted on the drive shaft 14, rotation of which imparts a downward movement to the push rod. Adjacent the cam 53 on the drive shaft 14 is another cam 54 that coacts with a follower arm 55 rigidly connected to the upper end portion of the push rod 45. The cam 54 rides on the underside of the follower arm 55 to raise the push-rod 45 from its lowermost position. The cams 53 and 54, and follower arm 55 are so designed as to move the push rod 45 downwardly and upwardly in proper sequence. Thus, downward movement of the push rod 45 will move the main rock lever 38 about its fulcrum 40 to raise the feed-gauge 34. At the same time, the auxiliary rock lever 48, will be moved about its fulcrum 47 in view of its connection 49 to the main rock lever, to elevate the feed element 20.

To move the feed element 20 horizontally there is provided a horizontally oscillating feed lever 57, fulcrumed intermediate its ends to a pivot 58 fixed to the underside of the bed 10. The forward end of the oscillating feed lever 57 is bifurcated as at 59 for engagement with a depending pin 60, connected to the free end of the feed element extension 27. The other end of the feed lever 57 is provided with a slotted eye 61 having engagement with the lower end of a push lever 62 mounted for vertical oscillating movement on the shaft 63 carried by the supports 64 within the pedestal 11. The upper end of the push lever 62 terminates in a flat abutment 65 for riding engagement with a cam 66, rotation of which actuates the push lever 62 to move the feed lever 57 about its fulcrum 58 to move the feed element 20 forwardly. To maintain the abutment 65 in contact with the cam 66 and to return the parts, i. e., the feed element 20 and its control levers to normal position, there is provided a spring 68 connected at one end to a suitable point in the wall of the pedestal 11 and at its other end to the push lever 62, see Figure 8*a*.

Stitching mechanism

Suspended from the free end of the neck 12 is the head 13 which comprises a box-like housing, rectangular in section and open at its top and bottom. The head 13 comprises a front wall 70, a rear wall 71 and side walls 72 and 73, and is attached by its side wall 73 to the flange 74 of the neck 12, in any desired manner as by screws (not shown). Formed in the side wall 73 is an opening 75 through which the drive shaft 14 extends, and which is supported by the anti-friction bearing 17 mounted on said side wall 73.

Arranged on the end of the drive shaft 14 is a crank disc 78 carrying a crank pin or cam follower 79 which projects into the cam groove 80 of the cam member 81. The cam member 81 is provided on its outer face with a horizontal boss 82 having an axial boss therein for the reception of rod 83 inserted therethrough. A set screw 84 securely locks the cam member 81 in adjusted position on the rod 83. The cam groove 80 formed on the inside face of the cam member 81 is of such curvature as to provide a reciprocatory

movement to the rod 83 only during a predetermined part of the rotation of the crank disc 78.

The rod 83 is mounted for reciprocating movement on the bearings 86 and 87 carried respectively by the front and rear walls 70 and 71, the ends of said rod extending outwardly of said walls. The end of the arm projecting outwardly of the wall 70 is pivotally connected as at 90 to the upper end of a lever arm 91 which is pivotally supported at its fulcrum 92 by the bracket 93. At the lower end of the lever arm 91 there is swivelly provided a needle carrying block 94 into which is fitted the end of the needle 95 in the manner well known. Suspended by means of the bolt member 96 from the wall 70 is a guide bracket 97 for the free end portion of the needle 95, the eye 98 thereof being always positioned rearwardly of the bracket 97. The height of the needle 95 above the bed 10 of the machine is such that when the feed-gauge 34 is in its raised position the needle 95 will freely pass through the slot 35 therein, as will be hereinafter described.

The yarn is threaded through the eye 98 of the needle 95 and is provided on a spool (not shown) conveniently mounted on a suitable part of the frame of the machine.

From the above it will be seen that rotation of the cam follower 79 will, viewing Figure 2, for a part of its revolution in the cam groove 80 of the cam member 81 impart thereto a reciprocating movement of the rod 83, which movement will cause a like reciprocation to the needle 95 through the action of the lever arm 91. This movement obviously is synchronized with the movement of the feed element 20 and feed gauge 34 so that when the latter is in its raised position the needle 95 will move through the same as will be hereinafter described for the placing of a stitch in the fabric.

Arranged within the head 13 of the machine between the walls 72 and 73 thereof is a vertical partition 100 that is secured in place by the screws 101, said partition being located at the lower half of said head as most clearly shown in Figure 3. On one side of the partition 100 formed vertically therein is a recessed groove 102 which is adapted to slidably receive the flat shank 103 of the presser foot 104 which is slotted at its lower end. Depending from the bottom edge of the partition 100 is an extension 105 provided with a lateral boss 106 which receives a set screw 107 for locking the shank 103 of the presser foot 104 in adjusted position. The presser foot when in its locked adjusted position acts as an abutment and guide for the fabric when moved by the feed element, and also serves as a guide and abutment for the fold *f* of the fabric, see Fig. 12, the shank 103 of the presser foot holding the same for penetration by the needle 95.

On the other side of the partition there is provided a similar recessed guide groove 109 in which is slidably positioned a feed gauge stop 110, the bottom edge of which is formed with a V-shaped groove 111 running lengthwise of said edge for co-action with the inverted V-shaped edge of the feed gauge 34, as most clearly shown in Figure 2. The upper edge of the gauge stop 110 terminates a distance below the end of the guide groove 109 and between the same is provided a spring element 112. Beneath the upper edge of the gauge stop is a vertical slot 113 through which the bolt member 96 extends for supporting engagement with the partition 100. The spring element 112 acts to cushion upward movement of the gauge stop 110 when acted upon by the feed gauge 34, as will be hereinafter described.

Stitch-cutting mechanism

The stitch formed in the fabric in the manner to be hereinafter described is cut by two scissor like members 115 and 116 arranged one on each side of the partition 100.

The scissor 115 is disposed on the presser foot side of the partition 100 and is mounted on the lower end of a vertically reciprocal scissor carrier rod 120 which slidably engages the face of the partition 100 and is guided in its movements by a guide block 121 fixed to the upper portion of the partition. Adjacent the upper end of the scissor carrier rod 120 there is provided a closed loop portion 122 which along with the scissor carrier rod 120 is in the plane of the crank disc 78, the loop 122 allowing the reciprocatory movement of the scissor carrier rod 120 by bridging the moving parts 78 and 80 of the device therein. The upper end 123 of the scissor carrier rod 120 is pivotally connected as at 124 to one end of a rocker arm 125, the other end of said rocker arm being pivotally supported as at 126 on a bracket 127 mounted on the neck 12 of the machine.

Between the ends of the rocker arm 125 there is pivotally suspended as at 130 a spoke 131 in which is adjustably fitted one end of a vertical push stem 132, the other end thereof carrying a cam follower 133. The push stem projects through an opening 135 formed in the neck 12 which at this point is formed with a circumferential enlargement 136 to accommodate a suitably designed cam 137 mounted on the drive shaft 14, all as clearly shown in Figures 3 and 4. Thus, rotation of the cam 137 will impart through the push stem 132 a rocking movement to the rocker arm 125 whereby to vertically reciprocate the scissor carrier rod 120 to bring the scissor 115 carried thereby into and out of operating position.

The scissor 115 comprises a fixed blade 115*a* attached by the screws 140 to the lower end of the scissor carrier rod 120, and a movable blade 115*b* pivotally attached at its upper end as at 141 to the upper end of the fixed blade. A tension coil spring 143 is attached at one end to the lower end of the movable blade 115*b* and at its other end to a suitable point on the wall 71 of the head 13 whereby to maintain the scissor blades in open relation.

To operate the scissor 115 there is provided a lever 145 fulcrumed on a longitudinal horizontal rod 146 supported at its ends on the opposed walls 72 and 73 of the head 13. The lower end of the lever 145 is attached in any desired manner to the lower end of the movable blade 115*b*, as for example by slotting the end of the lever 145 to fit over the movable blade 115*b*, or by a conventional form of pin and slot connection, and at its upper end the lever 145 is so formed as to have riding engagement with a suitable cam 147 mounted on the drive shaft 14 rearwardly of the crank disc 78. Thus, rotation of the cam 147 will rock the lever 145 about its fulcrum 146 to operate the movable blade of the scissor 115, this movement being so co-related to the reciprocating movement of the scissor 115 as to take place only when the scissor 115 is in its lowermost position.

The other scissor 116 located on the opposite side of the partition 100 comprises a fixed blade 116*a* and a movable blade 116*b*, both of which are suspended on the bolt member 96 and retained in cooperating relation by the nut 150.

The fixed blade 116*a* is secured to the partition wall by the screws 151. The movable blade 116*b* is provided with an extension 152, which is pivotally connected as at 153 to the lower end of a link member 154. At its upper end, the link 154 is pivotally connected as at 155 to the free end of an arm 156, pivotally mounted for swinging movement at its other end on the fixed pivot 157, the intermediate portion of said arm having riding engagement with a cam 158 mounted on the drive shaft 14 rearwardly and adjacent the cam 147. A tension spring 160, see Fig. 2, is connected at one end to the link 154 and at its other end to a suitable point on the wall 70, and serves the two-fold purpose of holding the scissor 116 open and at the same time maintaining the arm 156 in bearing engagement with the cam 158. The position of the scissor 116 is fixed, both blades thereof when open allowing the needle 95 to pass therebetween. The link 154 is so formed, as shown in Figs. 3 and 6 as to be resilient and flexible in planes at right angles to each other, the lower half being flexible so as to accommodate the arc of movement of the arm 156, see Fig. 6, and the upper half being flexible to accommodate the arc of movement of the movable blade extension 152.

Operation

The operation of the machine is shown in the various steps shown in Figures 12, 13, 14 and 15.

The fabric F is placed across the bed 10 of the machine and with the machine in operation a portion of the fabric F will be gripped by the gripping arms 21 of the feed element 20 moving the fabric F underneath the presser foot 104. At the same time the feed gauge 34 will along with the feed element 20 be elevated, the feed gauge 34 being first elevated to provide a fold F in the fabric, the fold being clamped between the feed gauge 34 and feed gauge stop 110 as clearly shown in Figure 12 which as hereinabove described has a yielding upward movement to prevent tearing of the fabric F; and thereafter the feed element 20 is raised to clamp the fabric against the presser foot 104. At this point the needle 95 threaded with the yarn Y is moved forwardly to penetrate the fabric at the fold F, the needle passing through the slots both in the presser foot and in the feed gauge. When the needle 95 on its return stroke has completely left the fold F, the stitch formed thereby in the fold F forms a loop L on the presser foot side of the fold. The scissor 115 is then lowered, the fixed blade 115*a* thereof entering the loop L and the scissor is operated to cut the loop. At the same time the scissor 116 is operated to sever the yarn adjacent the eye of the needle, thus completing the stitch forming and cutting operation. In order to insure the forming of a complete loop with each reciprocatory movement of the needle in and out of the fold *f*, the needle must be such as to have an eye construction in which the yarn is easily movable. Also the character of the yarn employed must be such as to have sufficient body so that upon penetration of the needle for a predetermined distance through the fold *f*, and its return out of the fold there will be formed in each instance a horizontal loop L, as shown in Fig. 13. The yarn Y is retained in the loop by friction, and inasmuch as the fold *f* does not move nor does the axial position of the needle with reference to the fold vary in its movement through the fold it is obvious that a like form of loop L will be formed in each instance, that is, for each fold *f* when formed. The size of the loop is obviously determined by the extent of movement of the needle as controlled by the operation of the stitch mechanism which is correlated with the scissor elements as to be cut thereby, in the manner as above indicated, as shown in Fig. 14.

The feed mechanism at this time operates on its return whereby the fold F is unfolded to pass under the presser foot, the whole above recited operation being again performed to form another stitch which when completed viewing Figure 15, will be spaced from the first stitch by a predetermined amount.

It will be observed that both ends of each stitch are on the same side of the fabric and due to the nature of the yarn employed will unravel to form a tuft.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the appended claim.

Having thus set forth and disclosed the nature of my invention what is claimed is:

In a tufting machine comprising a bed, a vertical pedestal, a horizontal neck carried by the upper end of said pedestal and parallel to said bed, a head carried by the free end of said neck and in superposed relation to said bed, and a presser-foot carried by said head; a feed element horizontally movable on said bed beneath said presser foot for moving a fabric thereunder, vertical movable means forming a part of said feed element for forming a vertical fold in said fabric, a gauge stop carried by said head arranged in the path of movement of said movable means and coacting with said movable means for clamping said fold in position so as to be penetrated by a horizontally reciprocating needle, said horizontally reciprocating needle carrying the thread or yarn and operating at a predetermined interval to pierce said fold whereby to form a loop on one side thereof, a vertically movable scissor element arranged on one side of said presser foot adapted for entry into said loop for severing the same and a stationary scissor element including a fixed blade and a movable blade arranged on the other side of said fold and presser foot for severing the connection of said thread or yarn to said needle.

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