Nov. 20, 1956 J. A. CASH, JR 2,771,045

METHOD AND APPARATUS FOR SEWING MULTI LAYERS OF MATERIAL

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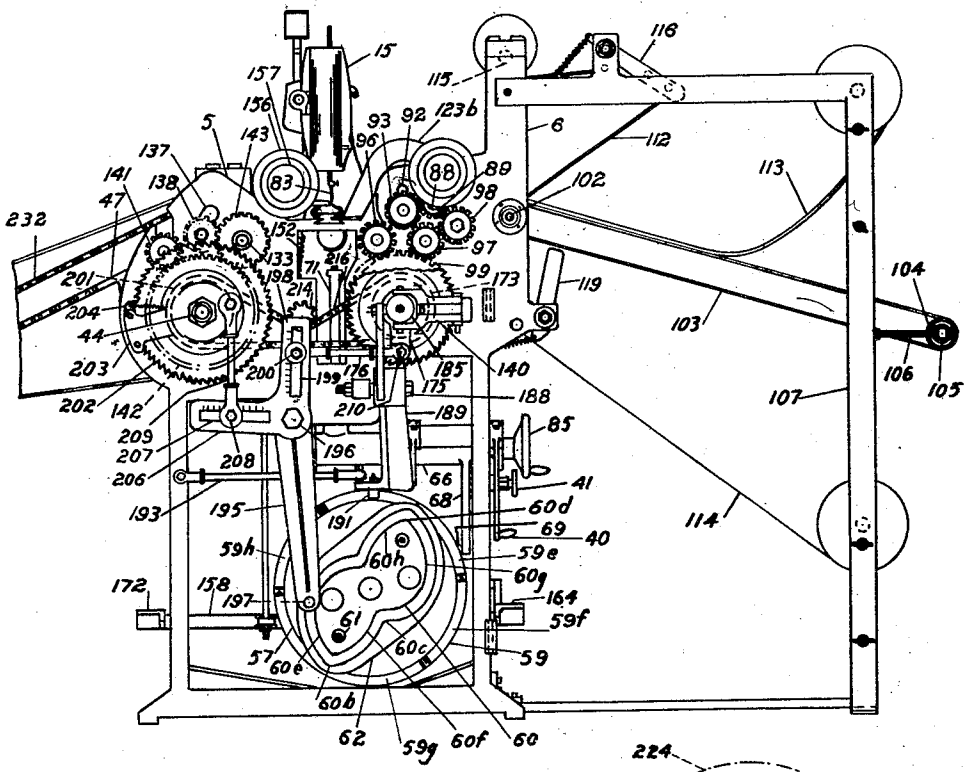
FIG. 1



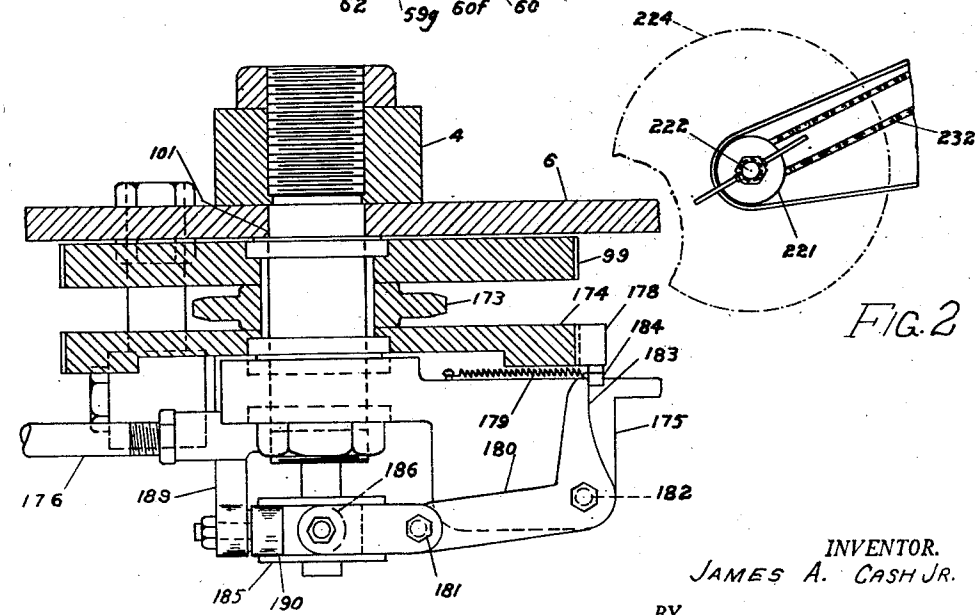


FIG. 2

FIG. 6

INVENTOR.
JAMES A. CASH JR.
BY
Arthur R Robert
ATTORNEY

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METHOD AND APPARATUS FOR SEWING MULTI LAYERS OF MATERIAL

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FIG. 3

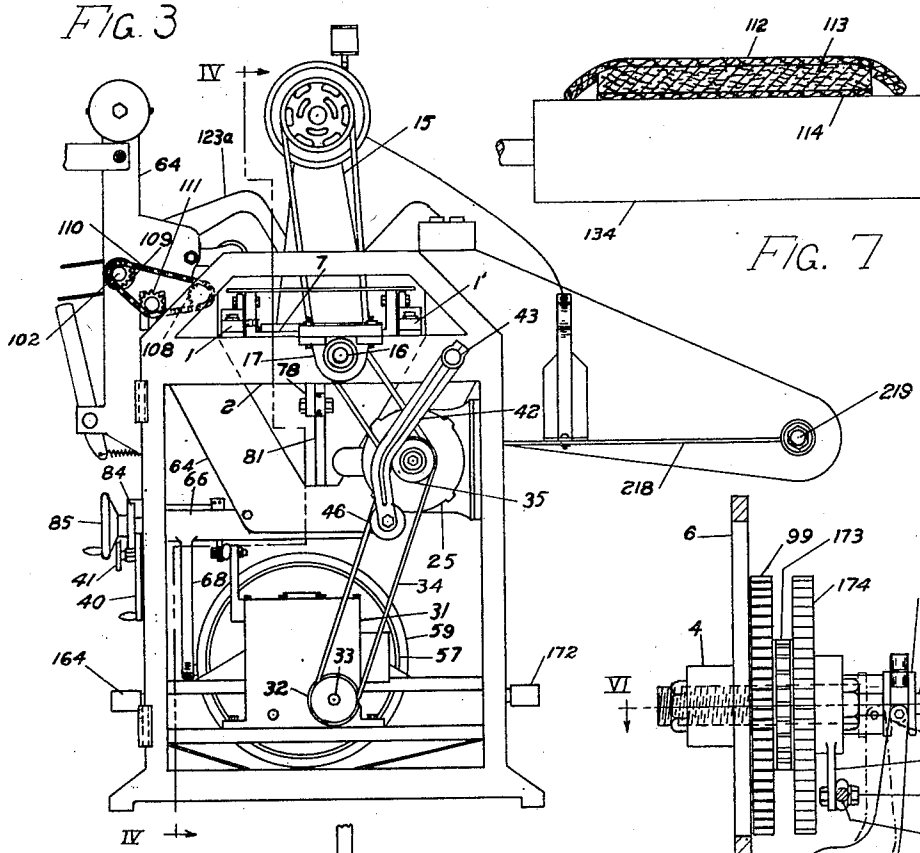


FIG. 7

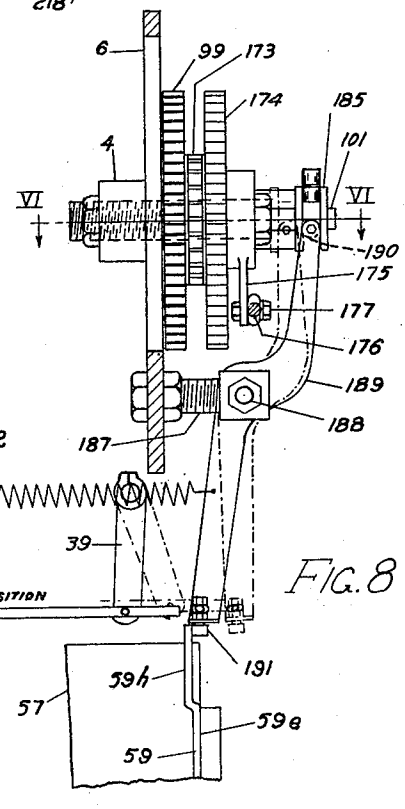
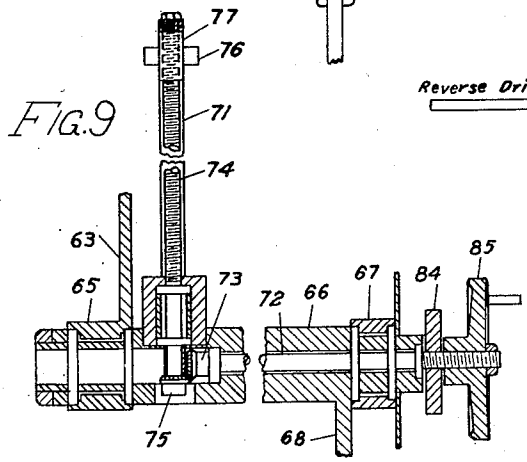


FIG. 8

FIG. 9



INVENTOR.
JAMES A. CASH JR.
BY
Arthur R. Robert
ATTORNEY

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METHOD AND APPARATUS FOR SEWING MULTI LAYERS OF MATERIAL

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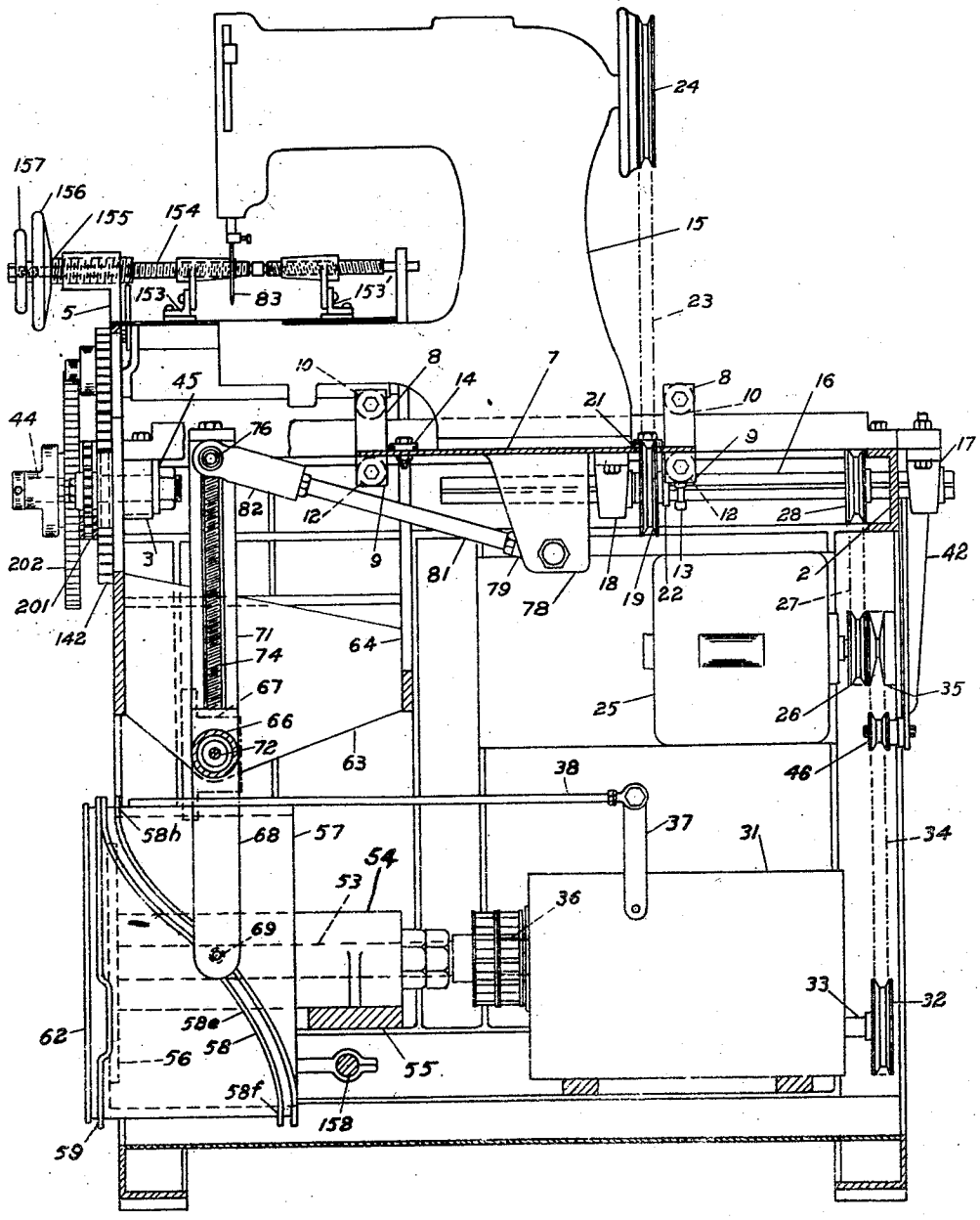

FIG 4

INVENTOR.
JAMES A. CASH JR.

BY

Arthur Robert

ATTORNEY

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METHOD AND APPARATUS FOR SEWING MULTI LAYERS OF MATERIAL

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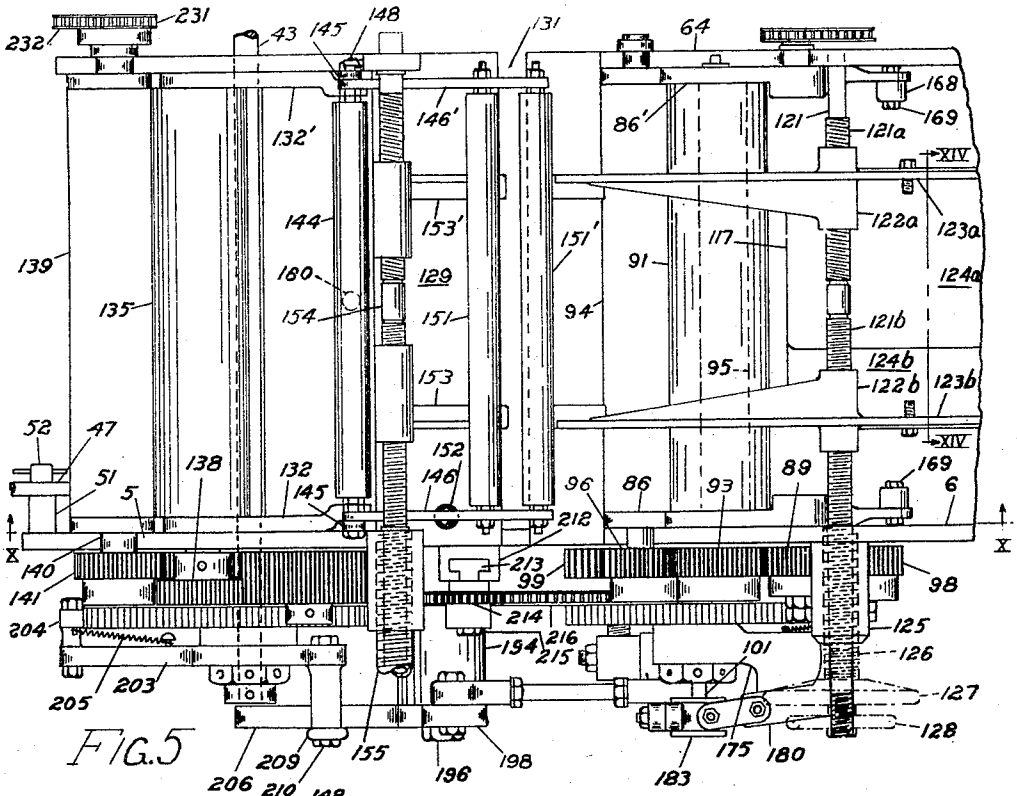

FIG. 5

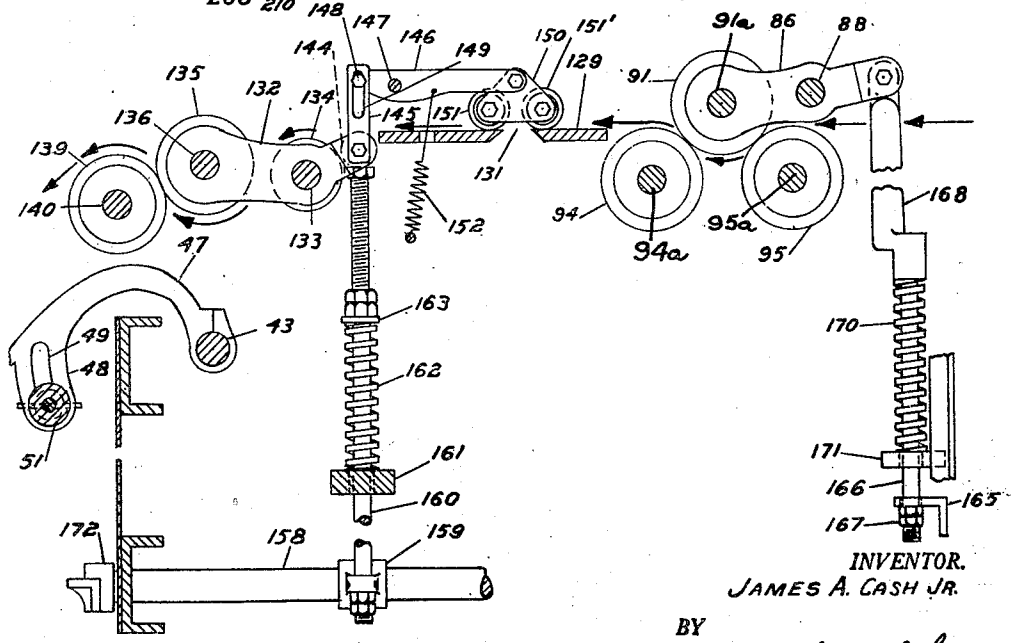

FIG. 10

INVENTOR.
JAMES A. CASH JR.

BY

Arthur Robert

ATTORNEY

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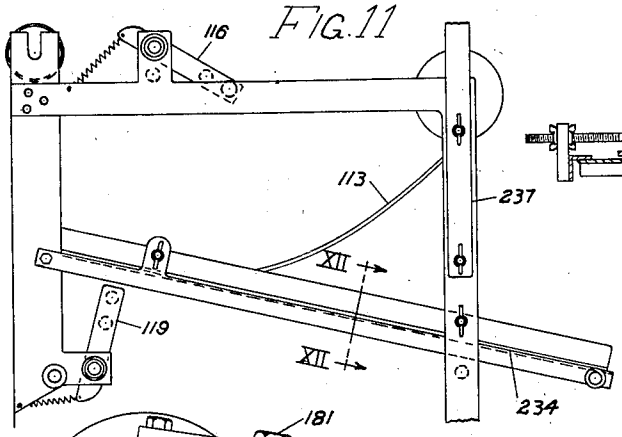
FIG. 11



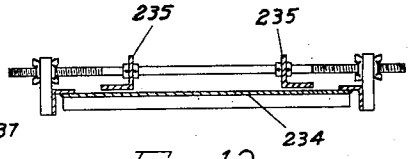


FIG. 12

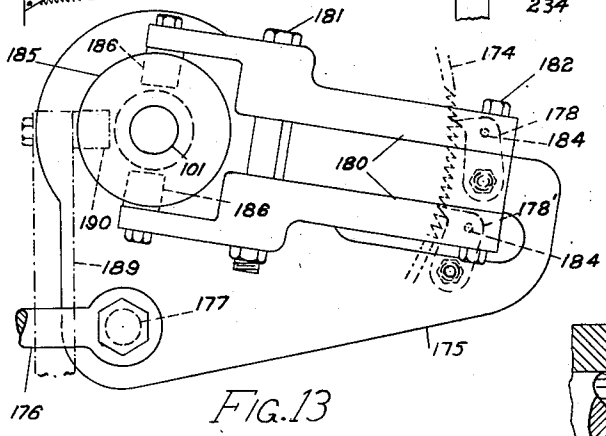


FIG. 13

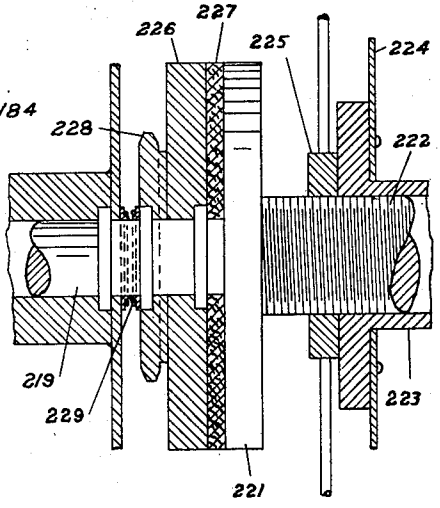


FIG. 15

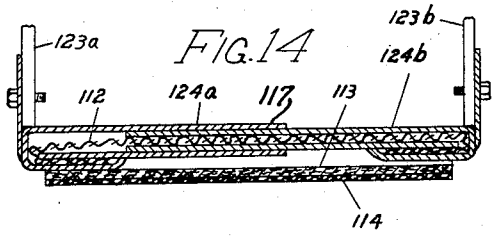


FIG. 14

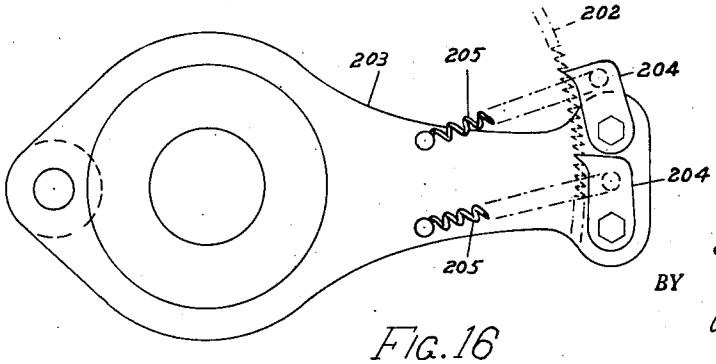


FIG. 16

INVENTOR.
JAMES A. CASH JR.
BY
Arthur Robert
ATTORNEY

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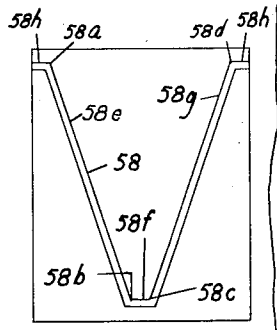


FIG. 17

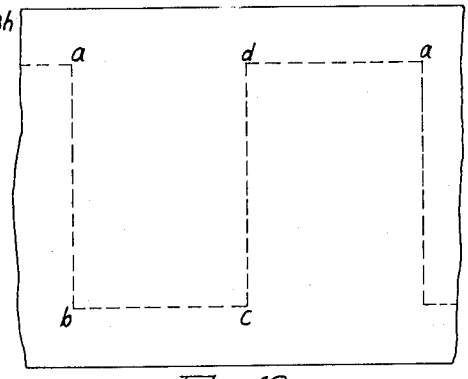


FIG. 18

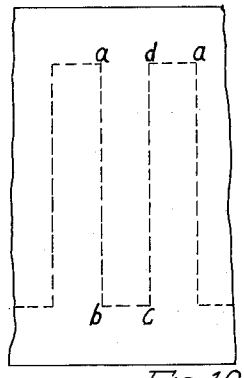
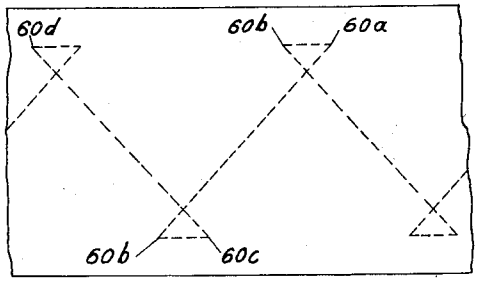


FIG. 19

FIG. 20



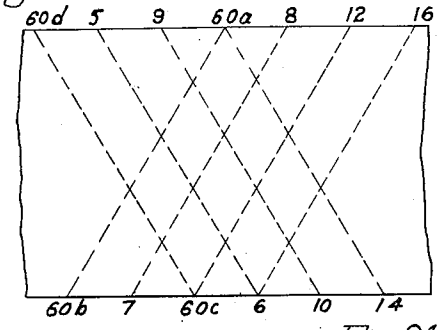


FIG. 21

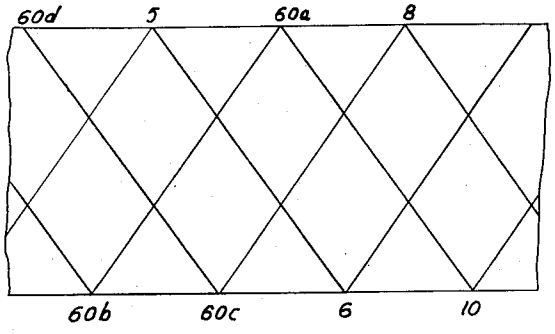


FIG. 22

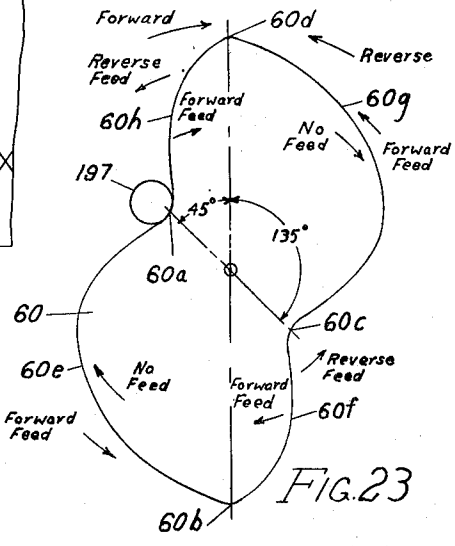


FIG. 23

INVENTOR.
JAMES A. CASH JR.

BY

Arthur R. Hirt

ATTORNEY

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METHOD AND APPARATUS FOR SEWING MULTI LAYERS OF MATERIAL

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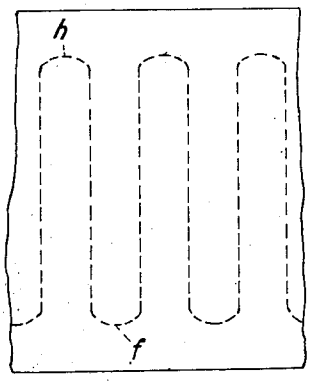

FIG. 25

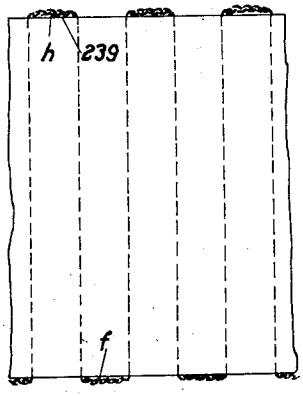

FIG. 26

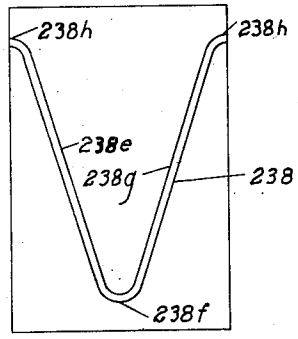

FIG. 24

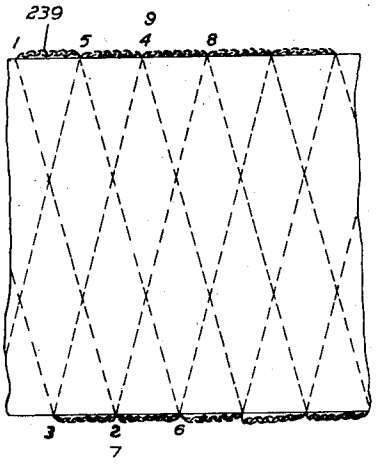

FIG. 29

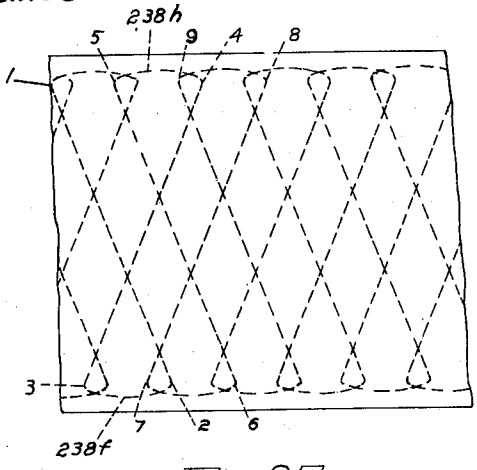

FIG. 27

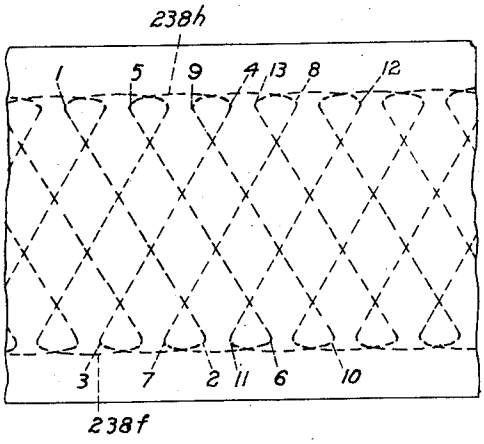

FIG. 28

INVENTOR.
JAMES A. CASH JR.

BY

Arthur R Robert

ATTORNEY

United States Patent Office 2,771,045 Patented Nov. 20, 1956

2,771,045

METHOD AND APPARATUS FOR SEWING MULTI LAYERS OF MATERIAL

James A. Cash, Jr., Louisville, Ky., assignor to American Mattress Machine Co., Louisville, Ky., a corporation of Kentucky

Application March 9, 1953, Serial No. 341,199

42 Claims. (Cl. 112—2)

The present invention relates to a method and apparatus for sewing multi layers of material and relates in particular to a method and a machine for sewing mattress borders in a novel manner.

The edge border of a mattress is usually formed of a layer of cloth and a layer of felt or wadding, and sometimes an underlayer of scrim is also included to support the wadding. The conventional way of sewing such border strips is by a series of transverse parallel lines of stitching lying generally at right angles to the running edge of the strip. Some machines make independent lines of stitching, severing the thread at the end of each pass, while other machines have the transverse lines successively joined by longitudinal lines of stitching in the material which serve to hold the hem of the border strip. It has also been proposed to employ diagonal crossed lines of stitching for this purpose, and multi needle machines for this purpose have been proposed. One disadvantage of a multi needle machine is that if one thread breaks or runs out, the machine continues to operate and produces an imperfect product that either must be reworked at added expense, or must be discarded. Such machines also are expensive to maintain.

According to the present invention, I provide a sewing machine which employing one needle, produces crossed transverse lines of stitching by a continuous operation. The machine alternately feeds the material, first in one direction, then in the other direction, and a sewing head is synchronously operated to traverse the material while the material is being fed. In this way crossed lines of transverse stitching are formed in a lattice pattern, and by properly proportioning the forward and reverse feeds, any desired number of lines of stitching per unit of length may be formed. In the preferred arrangement hereinafter described in detail the sewing head reciprocates with a dwell period at each end of the stroke. By feeding the material forward during the traversing stroke a diagonal line of stitches is formed. Then, while the sewing head dwells at the end of its stroke the material is fed rearwardly, the rearward feed being less than the forward feed, so as to position the needle at a forward point on the material. The material then is fed forwardly while the sewing head traverses on its return stroke, to produce a second diagonal line of stitches crossing the first diagonal line. The sewing head again dwells at the end of its stroke, while the material is fed rearwardly to position the needle at a forward point on the material. Because of the difference in forward and rearward feeds, the needle is now in position to make another parallel line of diagonal stitches spaced rearwardly from the first diagonal line of stitches and the cycle of operation is repeated. The ratio of forward and rearward feed determines the number of times the diagonal lines of stitching cross, and therefore adjustment of this ratio varies the pattern.

The invention also contemplates such a machine, which by a simple adjustment, may be operated to produce the conventional vertical stitch pattern. To convert the machine into one for producing parallel transverse lines of stitches, the rearward feed mechanism is rendered inoperative, and the phase relation of the traversing sewing head and forward feed is changed so that the material remains stationary while the sewing head is traversing the material, and the material is fed forwardly during dwell periods of the sewing head. In either case, the lines of connecting thread between transverse lines of stitching may lie in the material, or off the material adjacent the running edge. The latter arrangement presents the advantage that when the border is assembled to the mattress, bulkiness at the seam is avoided. The arrangement also allows for a great variety of designs and arrangements to be produced by a single machine.

Although in the preferred embodiment the stitching is continuous, I do not intend to exclude an arrangement in which the thread is severed so that the various transverse lines of stitching are disconnected.

The invention further contemplates an adjustment for the machine which enables it to operate on a wide range of widths of material; an adjustment for easily centering or shifting the material relative to the center of the sewing stroke; and an improved arrangement for keeping the material held down and in proper tension while it is being fed through the machine and while undergoing the stitching operations.

Other objects of the invention will be apparent from the following detailed description of the invention taken in connection with the accompanying drawings illustrating preferred embodiments of the invention by way of example, and wherein:

Figure 1 is a side elevation of an embodiment of the invention with the cover plate removed and part broken away;

Figure 2 is a side elevation of the broken off portion of Figure 1;

Figure 3 is a side elevation of Figure 1 as seen from the opposite side with part of the machine broken away;

Figure 4 is a section taken on line IV—IV of Figure 3 with parts removed;

Figure 5 is a plan view of Figure 1 with the sewing head removed and with parts broken away;

Figure 6 is a section taken on line VI—VI of Figure 8;

Figure 7 is an enlarged view illustrating an operating detail;

Figure 8 is an elevation of a subassembly as viewed from the left of Figure 1 or 6;

Figure 9 is a vertical section through the sewing head stroke adjusting mechanism;

Figure 10 is a skeleton view showing the arrangement of the feed rolls and their manual adjustment taken on line X—X of Figure 5;

Figure 11 is a side elevation of a modified support for the strips of material to be assembled;

Figure 12 is a section taken on line XII—XII of Figure 11;

Figure 13 is a side elevation of part of Figure 8 as viewed from the right, showing a pawl arm modified from that shown in Figure 1;

Figure 14 is an enlarged sectional view taken on line XIV—XIV of Figure 5;

Figure 15 is a cross section view of the wind up roll mechanism;

Figure 16 is an obverse elevation of a ratchet arm;

Figure 17 is a diagrammatic representation of one form of sewing head actuating cam;

Figures 18 and 19 are diagrammatic views illustrating the operation of the machine to produce a vertical stitching;

Figures 20, 21 and 22 are diagrammatic views illustrating crossed stitching designs;

Figure 23 is a diagrammatic view of a feed actuator cam;

Figure 24 is a diagrammatic representation of a modified head oscillating cam;

Figures 25 and 26 show representative designs produced by the cam of Figure 24; and

Figures 27, 28 and 29 illustrate crossed stitch patterns produced by the cam of Figure 24.

Referring to Figure 1, a composite web made of webs **112**, **113** and **114**, is fed into the machine at the rear (shown as the right side) passes forwardly to the left, and is wound up on a reel **224** at the front or left end. Referring to Figures 5 and 10, the course of the web is shown in Fig. 10 by the arrows. The composite web emerges from the hemmer **117** and passes between feed rollers **91**, **95**, **94**, over support **129** having a transverse slot **131** therein, under hold down rollers **151**, **151'**, and between rollers **134**, **135**, **139**. The sewing head **15** (Fig. 1) carrying a looper reciprocates transversely of the support over the slot **131** which allows the needle to pass through the slot to the looper. The forward feed of the web is accomplished by rotating the feed rolls to move the web in the direction of the arrows, and the reverse feed is produced by reversing the direction of rotation of the rolls.

Sewing head needle drive

Referring to the drawing (Fig. 3), a pair of guide bars **1**, **1'** are suitably secured to a cross bar **2** at one end of the frame and to the bosses **3**, **4** (Figs. 4 and 6) on the side plates **5**, **6** at the other end of the frame. A carriage plate **7** (Fig. 4) has projecting sets of bosses **8** and **9** at its corners, the upper set **8** having transverse holes to receive studs which carry the ball bearing rollers **10** bearing on the tracks or guide bars **1**, **1'** to support the carriage plate. The lower set of bosses **9** are slotted to receive studs which carry ball bearing rollers **12**, and by means of set screws **13** these studs and rollers may be adjusted vertically to bear on the lower face of the guide bars and eliminate play. Side thrust rollers **14** carried by suitable studs on the carriage plate engage the sides of the guide bars. The sewing head **15** is suitably secured to the carriage plate.

A splined drive shaft **16** is journalled in a bearing member **17** on an extension on the cross bar **2** and in a bearing member **18** mounted on the carriage, this shaft being held against endwise movement by suitable thrust collars. A pulley **19** extending through a slot **21** in the carriage has a keyed connection with the splined shaft **16** and is held between bearing **18** and thrust bearings inserted between the pulley and a fork **22** depending from the carriage. A belt **23** around pulley **19** and a pulley **24** on the sewing head transmits power to drive the sewing mechanism in the head. A motor **25** on the frame carries a pulley **26** on its shaft, and a belt **27** extending around pulleys **26** and pulley **28** on shaft **16** drives the shaft **16** and thus drives the mechanism of the sewing head through pulley **19**, belt **23** and pulley **24**.

Reversing mechanism

A gear box **31** on the frame contains a reversible gear mechanism of suitable construction which is driven through a pulley **32** on driven shaft **33** through a belt **34** extending around pulley **32** and a variable pitch pulley **35** on the motor shaft. Any suitable reversing gearing may be employed in box **31**, and as the details of the reversing gear forms no part of the invention they are not illustrated and will be described only briefly. The power input shaft **33** has a worm meshing with a worm wheel on a transverse shaft, suitably journalled in housing **31**, the transverse shaft carrying a mitre gear at its end. The driven shaft **36** carries a shifter sleeve splined thereon to which are fastened opposed mitre gears alternatively meshing with the driving mitre gear. By means of a lever **37** attached to the shifter sleeve in the gear box, the sleeve and mitre gears thereon are shifted along the driven shaft to drive the driven shaft **36** in forward or reverse, as desired. The lever **37** is operated by a rod **38** extending to the side of the machine and is shifted by a swivelled control arm **39** (Fig. 8) having an operating arm **40** (Fig. 3) equipped with a retractible detent **41** which holds the rod **38** and lever **37** in either forward or reverse position.

Variable speed cam drive

A belt tightener arm **42** is secured on a shaft **43** (Figs. 3, 5 and 10) suitably journalled at one end in the frame and at the other end in a hollow stud **44** (Fig. 1) passing into the boss **45** (Fig. 4) on the side plate **5**, this shaft being suitably held against longitudinal movement. Arm **42** carries an idler pulley **46** engaging the belt **34**. A bowed adjusting arm **47** (Figs. 10 and 3) is suitably clamped on shaft **43** near one end, the arm extending through a space in the frame, and has an extension **48** depending therefrom in which is formed an arcuate slot **49**. A boss **51** extending from side plate **5** has a tapped bore therein to receive the clamping bolt **52** which passes through slot **49**. By raising or lowering arm **47** the shaft **43** is rotated to move arm **42**, and the arm **47** may be locked in adjusted position by tightening bolt **52**. The shifting of idler pulley **46** by arm **42** adjusts the tension of belt **34** to vary the speed of driven pulley **32**. The driven shaft **36** (Fig. 4) extending from the gear box is suitably coupled to and drives a cam shaft **53** journalled in a long bearing **54** mounted on a cross member **55** on the frame. Cam shaft **53** carries a plate **56** on its end, and a cam cylinder **57** is bolted thereto, this cam cylinder having a cam track **58** thereon. This track is in the general shape of a pair of oppositely disposed half helixes **58***e* and **58***g* (Fig. 17) the ends of which are joined by circumferential portions, **58***f* and **58***h*, the points where joining occurs being indicated at **58***a*, **58***b*, **58***c* and **58***d*. The cylinder also has a flange or track **59** adjacent one edge (Fig. 4), this track comprising depressed portions (Fig. 1) **59***f* and **59***h* connected by plane or protruding portions **59***e* and **59***g*. In addition, a loop cam **60** is secured to the end of the cam cylinder, as by bolts **61**. This loop cam has curved portions (Fig. 23) **60***e*, **60***f*, **60***g* and **60***h*, meeting at minimum radius points **60***a* and **60***c*, and at maximum radius points **60***b* and **60***d*. A rim or flange **62** surrounds the cam edge to provide a track therebetween.

Sewing head stroke

A web plate **63** (Figs. 4 and 9) extending between the side plate **5** and an intermediate or bridge plate **64** carries a bearing **65** in which is journalled one reduced end of a sleeve **66**, the other reduced end of this sleeve being journalled in a bearing **67** bolted to the frame at the rear of the machine. At the rear an arm **68** on the sleeve carries a roller **69** which engages in the cam track **58**, and as the cam cylinder **57** and track **58** rotate the arm **68** and sleeve **66** are oscillated back and forth by the action of the cam track. A hollow flattened crank arm **71** is carried at the forward end of the sleeve. A rod **72** passing through the sleeve is journalled therein for rotation and at its inner end carries a mitre gear **73**. A threaded rod **74** in the crank arm **71** carries a meshing mitre gear **75** and a cross pin **76** on a sleeve **77** is threaded thereon. A fin **78** extending from the carriage plate **7** has a clevis **79** swivelled thereon and a connecting rod **81** is secured at one end to the clevis **79**, the other end of this rod being connected to a clevis **82** swivelled on cross pin **76**. Thus, as crank arm **71** oscillates it acts through the connecting rod **81** to reciprocate carriage **7** back and forth to reciprocate the sewing head **15**.

Stitch adjustment

The sewing head **15**, which reciprocates the needle **83** in known manner is driven at a uniform speed through pulleys **26**, **28**, belt **27**, shaft **16**, and pulleys **19**, **24** and belt **23** from the motor **25**. The shifting of arm **47**

(Fig. 10) up or down rotates shaft 43 (Figs. 10 and 3) to shift arm 42 and idler pulley 46, thus changing the tension of belt 34 and causing the variable V pulley 35 to change the speed of pulley 32. This, in turn, changes the speed of cam cylinder 57 and cam track 58 to change the speed of reciprocation of the sewing head, which is reciprocated back and forth by the connecting rod 81, crank 71, sleeve 66, arm and roller 68, 69 and cam track 58. Thus, by changing the speed of rotation of the cam track 58, the length of the stitch may be varied.

Sewing head stroke adjustment

Adjustment of pin 76 and sleeve 77 up or down along screw 74 changes the effective throw of crank 71, and thus changes the length of stroke of the sewing head. This adjustment is made at the rear of the machine by releasing lock nut 84 (Fig. 9) on the threaded end of shaft 72, and turning hand wheel 85 attached to the shaft, to raise or lower sleeve 77 and pin 76. Provision is made for the change in angularity of arm 68 and crank 71 so that for equal angular movements of arm 68 the horizontal component of movements will be equal. This is done by having the cam portions 58*a* and 58*c* depart slightly from a true helical form (not shown).

Rear feed rollers

A pair of arms 86, 86' (Fig. 5) are journalled on suitable stub shafts secured in the end plate 6 and intermediate plate 64 extending above the material supporting surface, one of the stub shafts 88 (Fig. 1) carrying a pinion 89 at its end. An upper feed roller 91 is carried by these arms on a shaft 91*a* (Fig. 10) which extends through an arcuate slot 92 in plate 6 and carries a spur gear 93 on its end meshing with pinion 89. Beneath roller 91 are two rollers 94 and 95 on shafts 94*a* and 95*a*, journalled in suitable bearings and carrying pinions 96 and 97 at the ends of their respective shafts. An idler pinion 98 suitably journalled on a stub shaft carried by plate 6 meshes with pinions 97 and 89. A large driver gear 99 mounted on a bearing on stub shaft 101 meshes with roller pinions 96 and 97, and thus drives rollers 94 and 95 in the same direction. Reversing idler gear 98 meshes with pinion 97 and idler pinion 89 which in turn meshes with pinion 92 and thus drives roller 91 in the opposite direction.

A shaft 102 (Fig. 1) journalled on the plates 64 and 6 carries a conveyor roller, and an endless conveyor belt 103 passes over this roller and a similar roller 104 on shaft 105. The latter shaft is adjustably mounted on threaded studs 106 carried on the frame extension 107. A sprocket 108 (Fig. 3) is carried on the end of the shaft 95*a* carrying roller 95, and shaft 102 carries a sprocket 109 at one end. An endless chain 110 passes around sprockets 108 and 109, and around an adjustable idler sprocket 111 whereby the conveyor is driven in synchronism with the feed rollers.

Hemmer and adjustment

The mattress ends generally are formed from two or more layers, comprising the outer cloth 112 (Figs. 1 and 7), padding 113, and a layer of scrim 114. A spindle 115 removably held in socket members on the plates 6 and 64 at the rear of the machine receives the roll of cloth and the cloth passes from the roll (not shown) around a suitable slack take-up member 116 into a hemmer 117 (Figs. 5 and 14). The padding or wadding 113 on a roll carried by a suitable spindle on the extension or bracket 107 on the frame passes down to the conveyor belt 103 which carries it into the hemmer, and the scrim 114 comes from its roll through a slack take-up device 119 (similar to 116) into the hemmer. The hemmer at the rear of the machine is of any suitable construction and is arranged to turn under the edges of cloth strip 112 to provide a hem (Figs. 5 and 14), while strips 113 and 114 pass under the cloth without being hemmed. Mounted in plates 6 and 64 (Fig. 5) is a shaft 121 having oppositely threaded portions 121*a* and 121*b*. Threaded sleeves 122*a* and 122*b* are carried on this shaft and webs 123*a* and 123*b* extending therefrom carry the generally U-shaped hemmer plates 124*a* and 124*b* in overlapping relation. Arms or webs 123*a* and 123*b* arch over the feed rollers and may have guide portions at their ends. By adjjusting the plates laterally, relative to each other, the amount of underlap or hem can be determined. A threaded bearing 125 on plate 6 carries an externally threaded sleeve 126 (shown in dot and dash lines) upon which is secured a hand wheel 127. This sleeve abuts a shoulder upon shaft 121 and by turning this hand wheel and sleeve the shaft 121 is shifted axially, thus shifting the hemmer bodily to center the work with relation to the stroke of the sewing head. By turning hand wheel 128 secured on shaft 121 this shaft is turned, and the oppositely threaded portions 121*a* and 121*b*, shift the plates 124*a* and 124*b* symmetrically about the centerline of the material to accommodate the desired width of cloth and provide the required turned under portion for hemming. The three layers of material from the hemmer pass over the rollers 95, 94, and are held against these rollers by the pressure of the upper roller 91 which bears downwardly against both rollers 95 and 94 by mechanism to be later described, and when the rollers are driven they draw the material through the hemmer. The material passes over the work supporting surface 129, in which is provided a transverse slot 131, to the forward feed rollers.

Forward feed rollers

At the forward end of the machine a pair of arms 132 and 132' are journalled upon a shaft 133 journalled in plates 5 and 64 and carrying a roller 134. Another roller 135 journalled on a shaft 136 is carried by the arms. The shaft 136 of this roller extends through an arcuate slot 137 (Fig. 1) in plate 5 and carries a pinion 138 at its end. A second roller 139 is carried on a shaft 140 extending through suitable slots in the frame, and carries a pinion 141 at its end. A driver gear 142 (Figs. 1 and 4) similar to gear 99 (Fig. 8) is journalled on the hollow stud 44, and pinion 141 meshes with this gear and is driven thereby in one direction. Roller 134 is journalled for rotation on shaft 133, and this shaft extends through the side plate and carries on idler pinion 143 meshing with pinion 138 and driver gear 142. Roller 135 bears on roller 139 and because of the engagement of gears 143 and 138 roller 135 is driven regardless of the position of arms 132, 132'. Roller 135 is set deeply relative to rollers 134 and 139, so that the material must make a deep bend or turn around roller 135 and this maintains traction between the roller and the cloth surface.

The deep set of roller 135 relative to roller 134 causes the material to make a sharp turn around roller 134, and because the material is under tension the wadding is compressed and the hemmed edges bear on roll 134. This is shown in Figure 7.

Work hold down

A bar 144 connects arms 132, 132' and at its ends carries a pair of links 145 swivelled thereon. A pair of arms 146, 146' suitably swivelled on the frame on stub shafts 147 are connected at their ends by pins 148 in slots 149 in links 145. Triangular bearing members 150 at the ends of arms 146, 146' carry rollers 151, 151' on opposite sides of slot 131. One or more springs 152 hold down arms 146, 146' to press rollers 151, 151' against the material to be sewed, and thus hold the material against the support surface 129.

If desired, work guide fingers 153, 153' may be provided on oppositely threaded shaft 154, the shaft being adjusted by an internally and externally threaded sleeve 155 having a hand wheel 156 thereon and by a hand wheel 157 on shaft 154.

Roller release

A shaft **158** (Figs. 10 and 4) carries a crank arm **159** to which is secured a rod **160**, which passes through a hole in cross bar **161** and is secured to bar **144**, as by a threaded connection and lock nut. A spring **162** abuts cross bar **161** at one end, and its other end is adjustably compressed by a washer **163** and lock nuts. This spring tends to raise rod **160** and thus presses arms **132, 132'** counterclockwise (as viewed in Fig. 10) about shaft **133** to press roller **135** against roller **139**. At its other end shaft **158** carries a foot pedal **164** which has an extension **165** (Fig. 10) to which a rod **166** is secured by a slip connection that may be adjusted by nuts **167**. A yoke **168** is pivotally connected at its upper ends to the arms **86, 86'** as indicated at **169, 169'** and the rod **166** connects to the middle of the yoke. A compression spring **170** surrounds rod **166**, one end of the spring engaging a cross bar **171** on the frame of the machine and the other end engaging the yoke. The spring biases the yoke and rod upwardly thus pressing arms **86, 86'** counterclockwise to press roller **91** against rollers **94, 95**. A foot pedal **172** (Fig. 1) is provided at the opposite end of the shaft **158**.

In initially stringing the material through the machine, by depressing either foot pedal **164** or **172**, the rod **166** and yoke **168** raise roller **91** enough so that the material from the hammer may be pushed manually between rollers **91** and **94, 95**. The depressing of the foot pedal also pulls down rod **160** and bar **144** thus raising roller **135** from roller **139**. It should be noted that the slotted connection **148, 149** permits rollers **91** and **135** to be raised without raising rollers **151, 151'**, and to raise these latter rollers, it is necessary to depress the foot pedal still further so as to take up the lost motion provided by pin and slot connection **148, 149**. The provision of foot pedals at the front and rear of the machine enables the operator to raise the rollers from either end. Under some conditions, the roller **151'** may be omitted, thus providing only one hold down roller **151**.

Rear roller drive

Referring to Figure 6, the stub shaft **101** carries the driver gear **99** and a sprocket **173** and ratchet wheel **174** integrally connected thereto. An arm **175** is freely swivelled on shaft **101** and is oscillated back and forth by connecting rod **176** pivotally connected thereto at one end at **177** (Figs. 8 and 13). At one end arm **175** carries the two pawls **178, 178'** suitably swivelled thereon, and biased by springs **179** into engagement with the ratchet wheel **174**. These pawls are arranged so that either one of them will engage a ratchet tooth, thus reducing lost motion to less than the distance between the teeth of the ratchet wheel. It will be seen that as the arm **175** is oscillated back and forth about shaft **101**, one of the pawls will engage and drive ratchet wheel **174** and gear **99** in one direction, thus driving the rear feed rollers, the pinions of which mesh with gear **99**, intermittently in one direction. On the reverse or idling stroke of arm **175** the pawls ordinarily would slide or ratchet over the teeth of the ratchet wheel, but provision is made to positively disengage the pawls on the idling stroke for a purpose presently to be described.

A pair of pawl lifter arms **180** tied together by a bolt **181** are pivoted to arm **175** at **182**, these arms each having a finger **183** which engages projections **184** on the respective pawls. A collar **185** on the reduced end of shaft **101** is slidable axially thereon, and rollers **186** carried by arms **180** engage in a peripheral groove in this collar. It will be seen that when collar **185** is in the position shown in Figure 6, the fingers **180** release the pawls which are thus allowed to engage the ratchet wheel **174**, but when the collar is shifted upwardly (to the left as seen in Figure 8) the fingers **180** will be rocked clockwise to lift and hold the pawls away from the ratchet wheel.

As seen in Figure 8, a stud **187** with a square head extends from plate **6**, and a swivel **188** therein supports a curved shifter arm **189**. At its upper end shifter arm **189** has a roller **190** which engages in the groove of collar **185** and the lower end of the arm carries a follower roller **191** which engages cam flange or track **59**. When roller **191** rides on a depressed portion **59*h*** (or **59*f***) of this cam the arm **189** is in the position shown in full lines in Figure 8, thus allowing the pawls to engage the ratchet wheel. When follower **191** lies on an extended portion **59*g*** (or **59*e***) of the track **59**, the collar **185** is held at the left as shown in dot and dash in Figure 8, thus holding the pawls out of engagement with the ratchet wheel.

Shifter arm **189** is biased by a tension spring **192** suitably connected thereto and to a part of the frame of the machine, and a tie rod **193** (Fig. 1) connected between the arm and the frame steadies the shifter arm.

A boss **194** (Fig. 5) extends from the side plate **5** and a follower arm **195** (Fig. 1) is journalled on stud **196** secured in this boss. At its lower end arm **195** has a follower roller **197** which engages the edge of cam **60** and arm **195** is rocked back and forth as cam **60** rotates. The upper end of arm **195** designated at **198** has a slot **199** in which is located a cross pin or bolt **200**, and connecting rod **176** is secured thereto by a suitable clevis. As arm **195** oscillates the connecting rod **176** is caused to reciprocate and in turn it oscillates pawl arm **175**. Bolt **200** may be shifted as desired in this slot to adjust the stroke of rod **176**, and may be locked in adjusted position by tightening this bolt. The arm **198** adjacent the slot may be graduated to facilitate adjustment.

Forward roller drive and its operation

The stub shaft **44** (Figs. 1 and 4) carries the driver gear **142** and a sprocket wheel **201** and ratchet wheel **202** integral therewith. A pawl arm **203** (Fig. 16) journalled on the stub shaft carries pawls **204** biased by springs **205** into engagement with the ratchet wheel **202**. The follower arm **195** has an angular extension **206** provided with a slot **207** in which is located a cross pin or bolt **208**, and connecting rod **209** is secured thereto by a suitable clevis. The other end of connecting rod **209** is joined to pawl arm **203** by a suitable swivel pin **210**. As arm extension **206** oscillates it reciprocates connecting rod **209** vertically thus oscillating pawl arm **203**. Bolt **208** may be shifted as desired in the slot to adjust the stroke of the connecting rod **209**, and thus adjust the driving stroke of pawl arm **203**.

A keyway **212** (Fig. 5) on the side plate **6** carries a block **213** to which is secured an idler sprocket **214** by a suitable clamping bolt **215**. A chain **216** passes around sprocket wheels **99** and **142** and under idler sprocket **214**, which may be adjusted vertically to take up slack in the chain. By this arrangement the two gears **99** and **142**, are driven in unison.

Conjoint operation of feed rollers

As the cam **60** rotates the follower arm **195** is oscillated. When the lower end carrying roller **197** is moved toward the right as seen in Fig. 1, extension **206** and connecting rod **209** move downward and pawl arm **203** is rotated clockwise in its driving stroke, thus rotating ratchet wheel **202** and driver gear **142**, which in turn drives the forward rollers **135** and **139** in a direction to feed material toward the left. Sprocket **201** is also rotated by ratchet wheel **202** and through chain **216** drives the sprocket wheel **173** and driver gear **99** clockwise, and the latter drives the rear feed rollers **91, 94** and **95** in a direction to feed material to the left. Referring to Figure 8, when the reverse driving gearing in box **31** is set to drive in the direction here referred to as forward (or clockwise as seen in Fig. 1), the operating bar **38** is in the extreme right hand position shown by dotted lines and thus holds the lower end of shifter arm **189** at the right, so that roller **191** is out of contact at all times with cam flange **59**, and in this position the pawls **178** are held out of engagement with the ratchet wheel **174**. For this reason, even though

ratchet wheel **174** is rotating clockwise through a greater angular distance than arm **175** is being moved by connecting rod **176**, there is no interference between the pawl arm and ratchet wheel. In this position of the reversing lever the feed rollers will be driven in unison intermittently to feed the material in one direction, namely, from right to left.

Referring to Figs 1 and 23, when the cam **60** is rotating in forward direction (clockwise) and assuming point **60***a* opposite roller **197**, the roller follows cam curve **60***e* to point **60***b*, thus moving to the left to operate pawl arm **203** to turn counterclockwise in idling direction. From point **60***b* the roller follows curved edge **60***f* to point **60***c* moving to the right to operate the feed rollers. From point **60***c* the roller follows curve **60***g* to point **60***d* to again move the pawl arm on its idling stroke, and from point **60***d* the roller follows curve **60***h* to the beginning point **60***a* to operate the pawl arm on its feeding stroke.

When the machine is operated in the reverse direction (counterclockwise as viewed in Figs. 1 and 23) the reverse lever **38** (Fig. 8) will be at the left, thus allowing follower roller **191** to follow cam flange **59**. Now, while follower roller **197** is moving alongside **60***e* from point **60***b* to point **60***a* on cam **60**, to the right as seen in Fig. 1, pawl arm **203** will be moved in its driving stroke and as roller **191** will lie on elevated part **59***e* of cam **59**, the pawls **178** are held retracted, so arm **203** drives the feed rollers to feed material forward (to the left). When roller **197** rides on curve **60***h* from **60***a* to **60***d*, roller **191** lies on depressed portion **59***h* of the cam track **59**, so that pawls **178** engage ratchet wheel **174**, and as connecting rod **176** moves arm **175** counterclockwise it drives the feed rollers to move the material from left to right.

Ratchet wheel **202** is being rotated counterclockwise through chain **216** and pawl arm **203** is being turned counterclockwise by its connecting rod. Pawl arm **203** has a longer angle of stroke than pawl arm **175**, so its pawls **203** ratchet or idle over ratchet wheel **202** and do not interfere with counterclockwise rotation. In moving from point **60***d* to **60***c* pawl arm **203** again drives ratchet wheel **202** to rotate the feed rolls for forward feed, and follower roller **191** lies on the raised portion **59***g* of cam **59** to hold pawls **178** retracted. When the follower **197** moves from point **60***c* to **60***b*, pawl arm **175** again drives the feed rollers for reverse feed. Thus, when the machine is operated in reverse direction, the material is fed through the machine alternately forward and reverse, and as the forward feed is greater than the reverse feed, the material is advanced through the machine.

Rollers **135**, **139** have a slightly greater diameter than rollers **91**, **94** and **95** (on the order of a few thousandths of an inch) and when the material is fed forwardly the former apply a tension to the material which helps to prevent bunching or wrinkling at the needle. This tension is not cumulative, because if the tension becomes great enough the rollers slip slightly over the material. On the reverse feed the hold down rollers **151**, **151'** confine the slack or tension relief to the portion of the material rearwardly of the needle (to the right as seen in Fig. 10), and this slack is taken up again on the forward feed.

Wind up reel

An extension **218** on the housing (Fig. 3) carries a shaft **219** (Figs. 3 and 15) having a flange **221** and a threaded portion **222**. A threaded sleeve **223** of the wind up reel **224** (Fig. 2) is received on the threaded portion of this shaft, and is locked to rotate therewith by the lock nut **225**. This reel preferably is adjustable in width to accommodate different widths of material. A disc **226** having a facing **227** of friction material is rotatable on shaft **219** and has a sprocket wheel **228** integral therewith. A spring **229** abutting the extension at one end biases the sprocket wheel, disc **226** and facing **227** against disc **221** so that when disc **226** is rotated it frictionally drives shaft **219** and the reel locked thereon. The shaft **140** (Fig. 5) of forward feed roller **139** carries a sprocket **231**, and a chain **232** passes around this sprocket and sprocket **228** to drive the reel in synchronism therewith. The friction drive allows slippage when the material is being wound on a small diameter, and also allows the reel to unwind when the feed rolls are feeding in the reverse direction, that is, from left to right as seen in Figure 1.

Modified material support

In the modified bracket shown in Figure 11 the conveyor and its drive are omitted, being replaced by an inclined plate or chute **234** which receives the wadding **113** from its roll and the wadding is drawn into the machine by the feed rollers. Side guides **235** positioned on plate **234** are adjustable laterally by the screwed rods **236** which are locked in adjusted position by the thumb screws. These guides serve to center the wadding relative to the hemmer as it is fed thereto. Also, an extension **237** on the bracket carries suitable tension means (not shown) so that where the cloth to form the outer layer is in strips, rather than in rolls, it may be fed under suitable tension to the hemmer over the tension means.

Operation

The machine is capable of forming two general forms or patterns of stitching with numerous variations of design. One pattern designated as vertical stitching is shown in Figs. 18 and 19, and the other pattern designated as crossed stitching is shown in Figures 20 to 22. The machine can be changed from the production of one design to the production of the other design merely by operation of the reversing lever. The operation in producing the vertical stitch design, accomplished by forward or clockwise rotation of the cams will first be explained.

In the forward position of reversing rod **38** cam roller **191** is maintained at all times at its extreme right, as shown in dotted lines in Figure 8, so that it does not engage cam **59**. Hence, pawls **178** are maintained at all times out of contact with ratchet wheel **174**, so the pawl arm **175** idles.

Referring to Figures 17, 18 and 4 when the roller **69** lies at point **58***a* the sewing head **15** is at the right end of its stroke ready to move to the left, and follower roller **197** (Fig. 23) is at point **60***a* on cam **60** ready to move to the left. As the head moves cam **60** rotates and follower **197** moves on its idling stroke, so the web remains stationary. The needle therefore sews across the web from *a* to *b* (Fig. 18). At **58***b* the sewing head dwells and roller **197** is at its furthermost point **60***b* on cam **60**. Continued rotation of cam **60** moves roller **197** to the right along cam edge **60***f* to actuate pawl arm **203** clockwise to actuate the feed rollers to feed the material to the left, thus producing a line of stitches from *b* to *c*. At **58***c* the sewing head starts its return traverse while the roller **197** travels along cam edge **60***g* and the feed pawl arm **203** again idles, thus forming the line of stitches *c* to *d*, and at **58***d* the sewing head again dwells while roller **197** travels along cam edge **60***h* to actuate the pawl arm **203** clockwise and the web is fed forward to form the line of stitches *d* to *a*. From here the cycle first described is repeated.

By adjusting the stroke of the sewing head the line of stitches *a* to *b* can be made of any desired length to vary the design or to accommodate any desired width of material. The line of stitches may terminate closer to the edges of the material, or further away as desired.

The forward feed is varied by adjusting cross pin **208** in slot **207**. By moving this pin to the left the stroke of connecting rod **209**, and pawl arm **203** is increased, and by moving pin **208** to the right, the stroke is decreased. By decreasing the stroke the feed from *b* to *c* and from *d* to *a* is decreased, thus producing a closer arrangement of vertical stitches *a*, *b* and *c*, *d*, as shown in Figure 19.

By changing the speed of rotation of cam cylinder **57**, the length of stitch is adjusted as previously described. This adjustment also changes the length of stitch on the lengthwise lines of stitching *b*, *c* or *d*, *a*, because the reciprocation of the sewing head and feed are synchronized as they are driven from the drive shaft **53** which directly drives their respective cams.

When the cams are operated in counterclockwise direction, cam roller **191** is released by reversing rod **38** to engage cam **59**, and the stitch designs shown in Figs. 20 to 22 may be produced. Although the rotation of cam **58** is reversed, its action is the same in either direction of rotation. When the sewing head starts its traverse on cam **58** to **58***c*, the roller **197** is moving on cam edge **60***g* to the right from **60***d* to **60***c*, to actuate the pawl arm **203** clockwise and turn the feeding rolls forward, thus producing the line of stitches (Fig. 20) **60***d* to **60***c*. When the sewing head is dwelling between **58***c* and **58***b*, the roller **197** travels on cam edge **60***f* to the left from **60***c* to **60***b*, and follower roller **191** engages portion **59***f* of cam **59**, so a pawl **178** engages ratchet wheel **174** to drive the feeding rolls in reverse to produce the line of stitches **60***c* to **60***b*. As the sewing head moves from **58***b* to **58***a* roller **197** travels on cam edge **60***e* to drive pawl arm **203** clockwise and feed the web forwardly to produce the line of stitches **60***b* to **60***a*, and while the sewing head dwells at **58***a* the roller **197** travels on cam edge **60***h* to reverse the web, and the line of stitches **60***a* to **60***b* is formed to start another cycle.

In Figure 20, the forward feed is from **60***d* to **60***c* and the reverse feed is from **60***c* to **60***b*, thus producing the crossed stitch pattern illustrated. The reverse feed can be adjusted by shifting cross pin **200** in slot **199**. By shifting it up the reverse feed is increased and by shifting it down the reverse feed is decreased. By adjustment of the reverse and forward feeds a great variety of designs of sewing can be produced. Also, by adjusting the stroke of the sewing head the crossed stitches may be run to the edges of the material or may be stopped short of the edges.

The design shown in Figure 21 is produced by having the reverse feed at about four-fifths of the forward feed. Because of the complexity of the pattern the description is supplemented by numbers. The stitches run from **60***d* to **60***c*, to **60***b*, to **60***a*, to 5, 6, 7, 8, 9, 10, 11 (**60***c*), 12, 13 (**60***a*), 14, etc. In Figure 22 the reverse feed is about two-thirds of the forward feed and the stitches run from **60***d* to **60***c*, to **60***b*, to **60***a*, to 5, 6, 7, (**60***c*), 8, 9 (**60***a*), 10, etc. It will be apparent that the closer the reverse feed approaches the forward feed, the greater will be the number of times the stitches cross.

It will be seen that the portions **60***f* and **60***h* of cam **60** serve to intermittently operate the web feeding means in one direction. Thus, when producing vertical stitching this cam portion operates the feed forward intermittently, and when producing crossed stitching this cam portion operates the feed rearward intermittently. The portions **60***e* and **60***g* of cam **60** intermittently operate the feed in one direction (the opposite or forward direction) when producing crossed stitching, and on vertical stitching these portions of the cam are rendered inoperative, this taking place while the head is moving across the web.

In the mechanism illustrated, the selection between the two feed mechanisms is made by reversing the direction of rotation of cam **60**. The sewing head reciprocates in the same manner whether the machine is producing vertical stitching or crossed stitching, and it is not necessary, therefore, to reverse the direction of rotation of cam **58**. However, in the preferred embodiment illustrated, when cam **60** is reversed, cam **58** also is reversed. The invention is not confined to reversing mechanism for selectively changing the feed from intermittently in one direction to alternately in opposite directions, as this change may be accomplished by supplying the web from the opposite end of the machine while the forward feed is rendered inoperative; or by other selective mechanisms which change the phase relationship of feed to head stroke, so that under one set of operating conditions the feed occurs in one direction while the head is reciprocating, and under another set of operating conditions the feed mechanism is reverse, with or without idling periods.

When operating with the modified form of cam **238** shown in Figure 24 a modified design is produced. In this cam the dwell period of the sewing head is eliminated. The ends of track portions **238***e* and **238***g* are joined by curved portions **238***f* and **238***h*. On forward rotation this cam produces the design shown in Figure 25, where the curved stitched portions *h* and *f* are made while the head is on portions **238***h* and **238***f* of the cam track.

When the stroke of the sewing head is adjusted to cause the needle to run off of the material at the ends, the design shown in Figure 26 is produced. That is, while the needle is operating off of the material the feed of material occurs, thus pulling thread through the needle, this thread being twisted by the looper with the bobbin thread, and the feed of material stops when the needle reenters the material on the return stroke. This produces a twisted connecting strand **239** which lies adjacent the edge of the material. An advantage of this arrangement is that the connecting strand does not add to the bulk of the seam when the material is sewn to the mattress, and the strand is covered and is invisible. Also, in operating in this way, the hold down roller **151'** and guides **153**, **153'** may be omitted.

When operating in reverse rotation, designs illustrated in Figs. 27, 28 and 29 can be produced. Referring to Figure 27, starting at 1, the sewing head is traversing and the material is being fed forwardly, and at the point 2 the sewing head starts on the connecting curved track portion **238***f*. Here the reverse feed starts and the curved line of stitches **238***f* is formed, and at 3 the forward feed begins and the sewing head starts its return traverse. At 4 the sewing head enters the curved cam portion **238***h* and the reverse feed starts, and at 5 the forward feed starts and the traverse of the needle is resumed. The pattern continues as indicated by the numbers 6, 7, 8, 9, etc.

The design in Figure 28 is made similarly by a different forward feed-reverse feed ratio, and the course of the needle can be traced by following the numbers 1, 2, 3, 4, etc.

In producing Figure 29, the needle is run off of the material to produce a twisted strand **239** lying adjacent the edge of the material. In this pattern the reverse feed is two-thirds of the forward feed. By changing the stroke of the head and varying the feed ratios, a large variety of patterns or designs can be produced. Also, by modifying the portions **238***e* and **238***g* of the cam other variations in design, such as a figure eight, or a circle, may be produced.

I claim as my invention:

1. The method of stitching a web of material which comprises: sewing said web with a needle moving transversely while moving said web longitudinally with a generally rectilinear movement in one direction to produce a line of stitches extending generally transversely of the web from one longitudinal edge to the other; moving said web longitudinally in the opposite direction while said needle remains in a stationary position to produce a line of stitches extending generally longitudinally of the web; then moving said web longitudinally in said one direction while moving said needle transversely to produce a line of stitches extending generally diagonally of the web and intersecting the first line of stitches; then moving said web longitudinally with a generally rectilinear movement in said opposite direction while said needle remains in a stationary position; one of said longi-

tudinal movements of the web being greater than the other.

2. The method of stitching a web of material as specified in claim 1 wherein: said needle forms connecting stitches off of the web while it remains in said stationary positions.

3. An apparatus for sewing a web of material which comprises: a web support; a sewing head operating a sewing needle; web feeding means for alternately forwardly and rearwardly feeding a web of material over said support to said needle in a longitudinal direction; and means for reciprocating said sewing head transversely of the support in timed relation with the feeding means.

4. An apparatus as specified in claim 3 having means holding said sewing head at the end of each reciprocating stroke while the feeding means is operating rearwardly.

5. An apparatus as specified in claim 4 wherein the means for reciprocating the sewing head operates during the forward feed.

6. An apparatus as specified in claim 3 having means for adjusting the head reciprocating means for varying the length of the reciprocating stroke of the sewing head.

7. An apparatus as specified in claim 3 wherein the forward and rearward feeds of the web are unequal.

8. An apparatus as specified in claim 3 having means for adjusting the web feeding means to vary the rate of feed of the web.

9. An apparatus as specified in claim 3 having means for adjusting the web feeding means to vary the forward rate of feed of the web.

10. An apparatus for sewing a web of material which comprises: a web support; a sewing head operating a sewing needle; means for moving said sewing head across the support; means for feeding a web of material longitudinally in one direction across the support; and means for alternately reversely feeding the web of material unequally in the opposite direction across the support.

11. In a web sewing apparatus: a support for said web; a pair of feed rolls adjacent the intake end of the support; a pair of feed rolls adjacent the discharge end of the support; means intermittently driving the feed rolls in one direction to feed the web in one direction; means intermittently driving the feed rolls in the opposite direction to feed the web in the opposite direction; a sewing head operating a sewing needle; and means for reciprocating said sewing head across said support transverse to the direction of feed.

12. An apparatus for sewing a web of material comprising: a web support; a sewing head operating a sewing needle; a motor; a cam carrier having a plurality of cams thereon; power transmission means between the motor and cam carrier including a reversing drive for selectively rotating the cam carrier in either direction; transmission mechanism between the cam carrier and sewing head cooperating with one of said cams to reciprocate said head; and feed means actuated by another of said cams on said carrier for alternately feeding material through said apparatus.

13. An apparatus as specified in claim 12 wherein said feed means includes intermittently operated means for feeding material in one direction; intermittently operated means for feeding material in the opposite direction; and means associated with the reversing drive for holding one of said intermittent feeding means inoperative in one position of the reversing drive.

14. An apparatus as specified in claim 12 wherein said feed means includes rotary feed rollers at opposite sides of the sewing needle coupled for conjoint operation; a pair of transmission means for alternately driving said rollers intermittently to feed in opposite directions including uncoupling means for intermittently disconnecting one of said pair of transmission means when the other of said pair is driving.

15. An apparatus as specified in claim 14 having means associated with the reversing drive for holding the uncoupling means in disconnected position when the reversing drive is in one of its positions.

16. An apparatus as specified in claim 12 wherein the power transmission means between the motor and cam carrier includes speed changing mechanism.

17. An apparatus as specified in claim 12 having power transmission means between the motor and sewing needle in advance of the reversing drive to operate said needle.

18. In an apparatus for sewing a web of material: a sewing head operating a sewing needle; means for reciprocating said sewing head; web feeding means; reversible actuating means for the web feeding means operative in one direction to intermittently actuate the web feeding means in forward direction, and operative in the reverse direction to actuate the web feeding means alternately in forward and reverse directions; and means for selectively reversing said actuating means.

19. An apparatus for sewing a web of material comprising: a web support; a sewing head reciprocable across said support; feeding means at the ends of said support comprising pinch rolls; ratchet drive means coupled to said rolls for driving said rolls in one direction; a second ratchet drive means coupled to said rolls for driving said rolls in the opposite direction; and means for disengaging one of said ratchet means while the other ratchet means is in driving engagement.

20. In an apparatus for sewing a web: a frame; a sewing mechanism mounted on said frame for sewing said web; a feed roller mounted in said frame for vertical movement; a hold down member adjacent the sewing mechanism; means connecting said feed roller and hold down member for conjoint vertical movement; and a manually operated member extending from said means for moving the same.

21. A sewing apparatus as specified in claim 20 having a second feed roller mounted on the frame for vertical movement and connected to said manually operated member.

22. In an apparatus for sewing a web of material: a sewing head operating a sewing needle; means for reciprocating said sewing head; web feeding means for feeding a web of material to said needle; a reversible mechanism including alternately operating means for actuating said web feeding means alternately in forward and reverse directions; and reversing means for said mechanism including means for rendering one of said alternately operating means inoperative in one position of said reversing means.

23. An apparatus as specified in claim 22 wherein said means for reciprocating said sewing head is synchronously driven with the reversible mechanism in one position of the reversing means to feed the web while the sewing head is reciprocating.

24. An apparatus as specified in claim 22 wherein the means for reciprocating the sewing head provides a dwell for the sewing head at one end of its stroke; said means is synchronously driven with the reversible mechanism in one position of the reversing means to feed the web forward while the head dwells; and in the other position of the reversing means to feed the web in reverse direction while the head dwells.

25. In an apparatus for sewing a web: a sewing head operating a sewing needle; means for reciprocating said sewing head; web feeding means for feeding a web of material to said needle; a cam; transmission means between said cam and web feeding means for operating said web feeding means intermittently in one direction; transmission means between said cam and web feeding means for operating said web feeding means intermittently in the opposite direction; and selective means for rendering one of said transmission means inoperative.

26. An apparatus as specified in claim 25 wherein said cam has plural timing portions cooperating with said transmission means.

27. An apparatus as specified in claim 25 wherein each said transmission means comprises pawl and ratchet means.

28. An apparatus as specified in claim 25 having means for reversing the rotation of said cam.

29. In an apparatus for sewing a web: a sewing head operating a sewing needle; means for reciprocating said sewing head; reversible web feeding means for feeding a web of material to said needle; a rotary cam; transmission means cooperating with the cam and connected to the web feeding means for driving the web feeding means forwardly during one portion of the cam rotation and rearwardly during another portion of the cam rotation; and means for selectively rendering said transmission means inoperative during one portion of the cam rotation.

30. In an apparatus for sewing a web: a sewing head operating a sewing needle; means for reciprocating said sewing head; reversible web feeding means; a rotary cam having a forward feed portion and a rearward feed portion; power transmission means cooperating with said cam portions and feeding means for driving said feeding means alternately forward and rearward respectively; means for reciprocating said sewing head across the web, in synchronism with one of said cam portions to traverse said web while the transmission mechanism is opposite said one cam portion; and means for selectively changing the relation of said transmission mechanism to said reciprocating means to cause the head to traverse said web while the transmission means is opposite said other portion of the cam.

31. In an apparatus for sewing a web: a sewing head operating a sewing needle; means for reciprocating said sewing head; web feeding means; a first means timed relative to the sewing head for intermittently operating said web feeding means in one direction while the sewing head is moving across the web; a second means for intermittently operating said web feeding means in the opposite direction; while the sewing head is near the ends of its movement and selective means for rendering said first means inoperative while the sewing head is moving across the web.

32. An apparatus as specified in claim 31 wherein said selective means includes reversing means for changing the direction of operation of said second means.

33. In an apparatus for sewing a web: a sewing head operating a sewing needle; means for reciprocating said sewing head; web feeding means for feeding a web of material to said needle; means for intermittently operating said web feeding means in one direction; means for operating said web feeding means alternately in opposite directions; and means for selectively rendering one of said latter two means inoperative.

34. In an apparatus for sewing a web: a sewing head operating a sewing needle; means for reciprocating said sewing head; web feeding means for feeding a web of material to said needle; a first means intermittently operating and timed relative to the movement of the sewing head to commence operation of said web feeding means at a predetermined time in the reciprocation of said head; and means for selectively changing timed relation of said head and first means to stop operation of the web feeding means at said predetermined time in the reciprocation of said head.

35. In an apparatus for sewing a web: a sewing head operating a sewing needle; means for reciprocating said sewing head; web feeding means for feeding a web of material to said needle including oppositely acting ratchet means; common drive means coupled to said ratchet means for driving said ratchet means; and selective means for rendering one of said ratchet means inoperative.

36. An apparatus as specified in claim 35 wherein: said ratchet means includes ratchet wheels coupled for conjoint rotation; and pawls for each ratchet wheel driven by said common drive means; and having means for maintaining one of said pawls out of engagement with its ratchet wheel while the other pawl is driving.

37. An apparatus as specified in claim 35 wherein said common drive means comprises an oscillating arm; and connecting rods between said arm and ratchet means.

38. An apparatus as specified in claim 37 wherein said connecting rods are adjustable along said arm to vary the stroke thereof.

39. An apparatus as specified in claim 37 wherein said arm has branches with said connecting rods connected to said respective branches.

40. An apparatus as specified in claim 8 having means for adjusting the web feeding means to vary the rearward rate of feed of the web.

41. In a web sewing apparatus: web support means; a pair of edge guides for said web; a screw threaded socket adjacent said guides; means for adjusting said edge guides individually and in unison laterally across the support means comprising a shaft passing through said socket having opposed screw threaded portions connected by complementary threads to said edge guides; and an internally threaded sleeve passing through said socket, said sleeve being threaded on said shaft and being externally threaded to cooperate with said socket; rotation of said sleeve causing longitudinal movement of said shaft to shift said edge guides in unison, and rotation of said shaft in the socket shifting the spacing of said edge guides.

42. In an apparatus for sewing a web of material: a support for the web; a set of power coupled feed rolls adjacent the forward end of said support to receive and grip said web; a set of power coupled feed rolls adjacent the rear end of said support to receive and grip said web; and common power means coupled to said sets of rolls to rotate said rolls, the peripheral speed of the forward feed rolls being greater than the peripheral speed of the rear feed rolls to maintain the web between the sets of rolls under tension, and means operating a sewing needle to pass the needle into the web between the sets of rolls, said common power means being reversible and including means for disengaging one set of rolls while driving the other set in reverse direction.

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