

Sept. 9, 1952

J. A. CASH ET AL

2,609,768

EDGE ROLL FORMING AND SEWING MACHINE

Filed Nov. 17, 1947

8 Sheets-Sheet 1

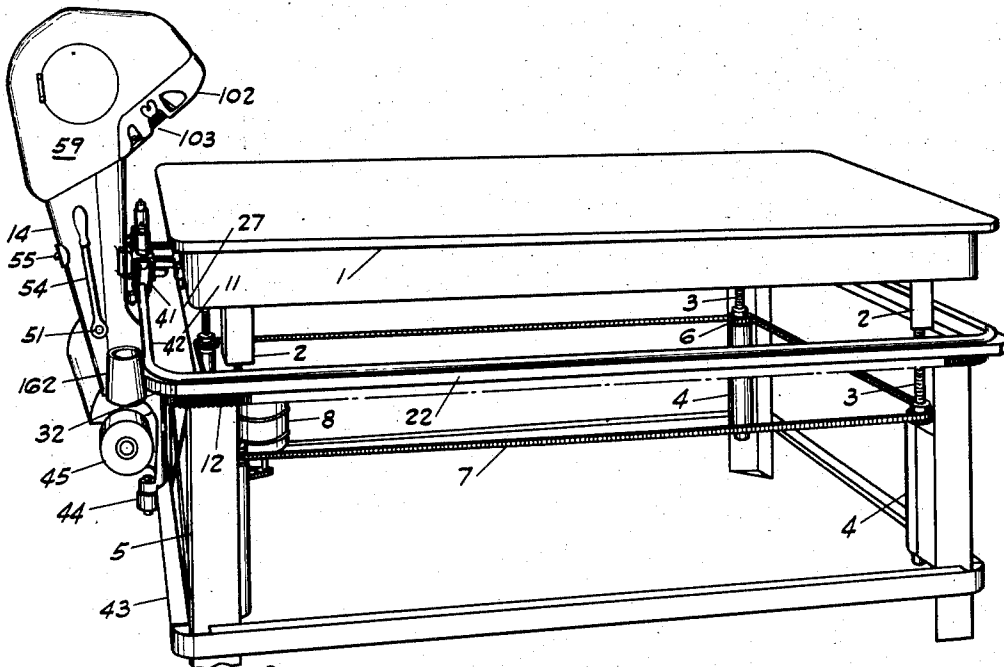


Fig. 1

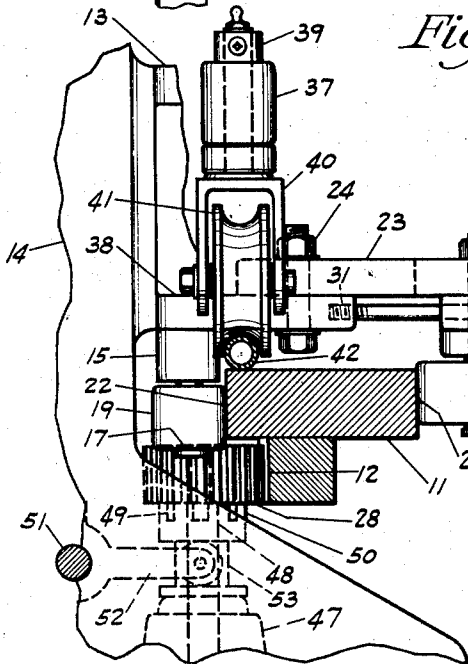


Fig. 2

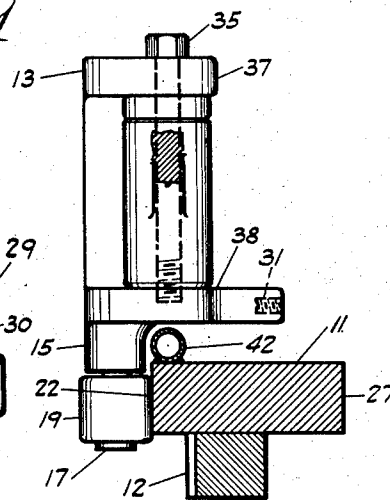


Fig. 3

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8 Sheets-Sheet 2

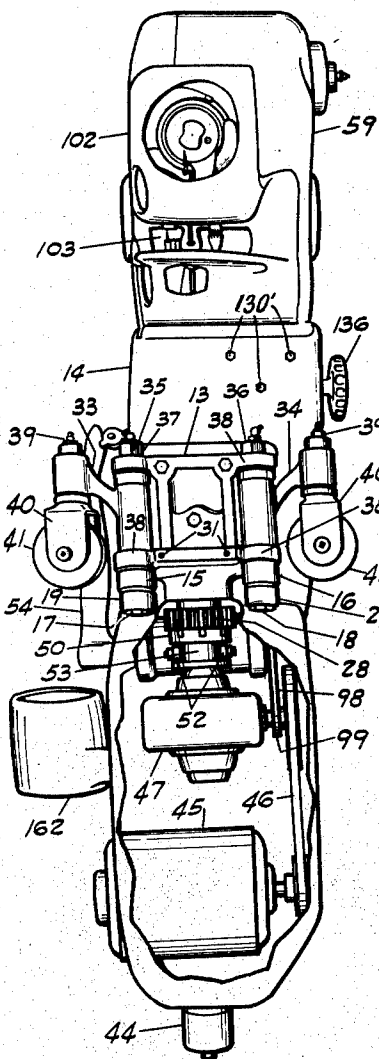


Fig. 4

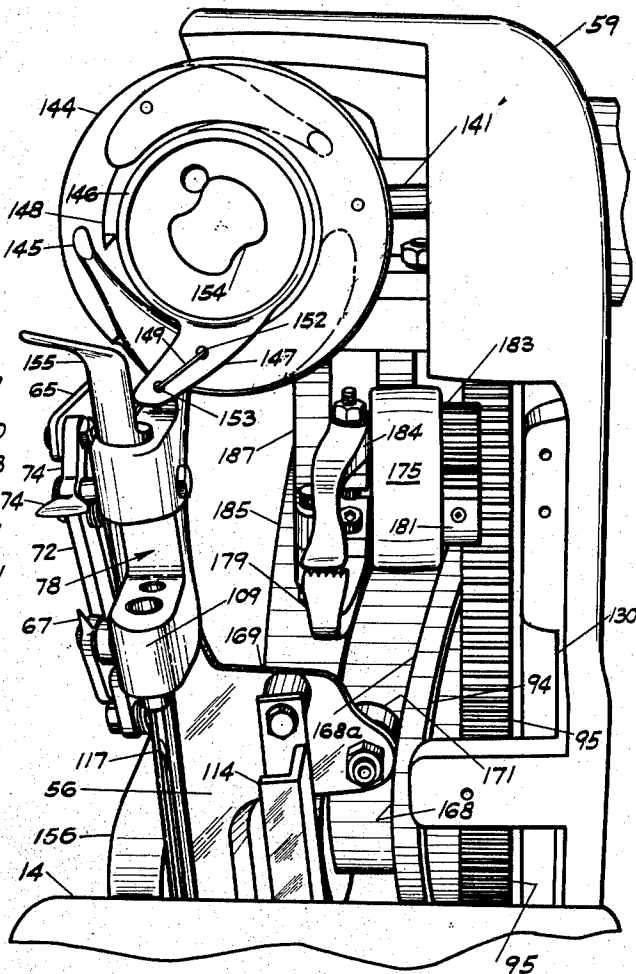


Fig. 6

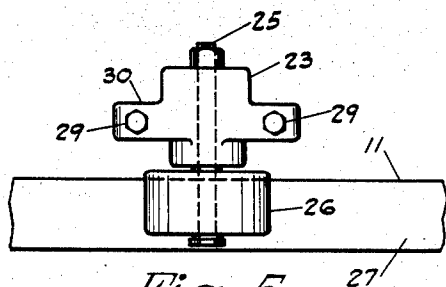


Fig. 5

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8 Sheets-Sheet 3

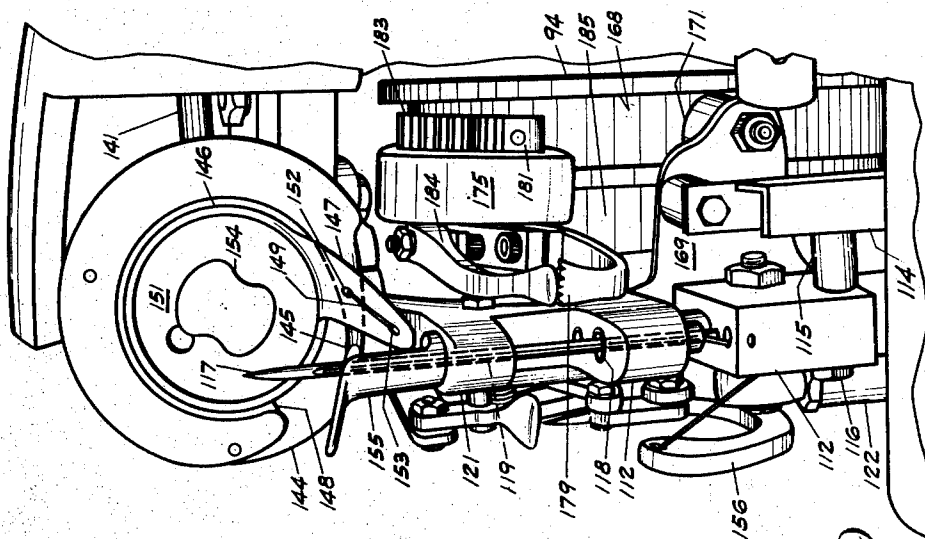


Fig. 9

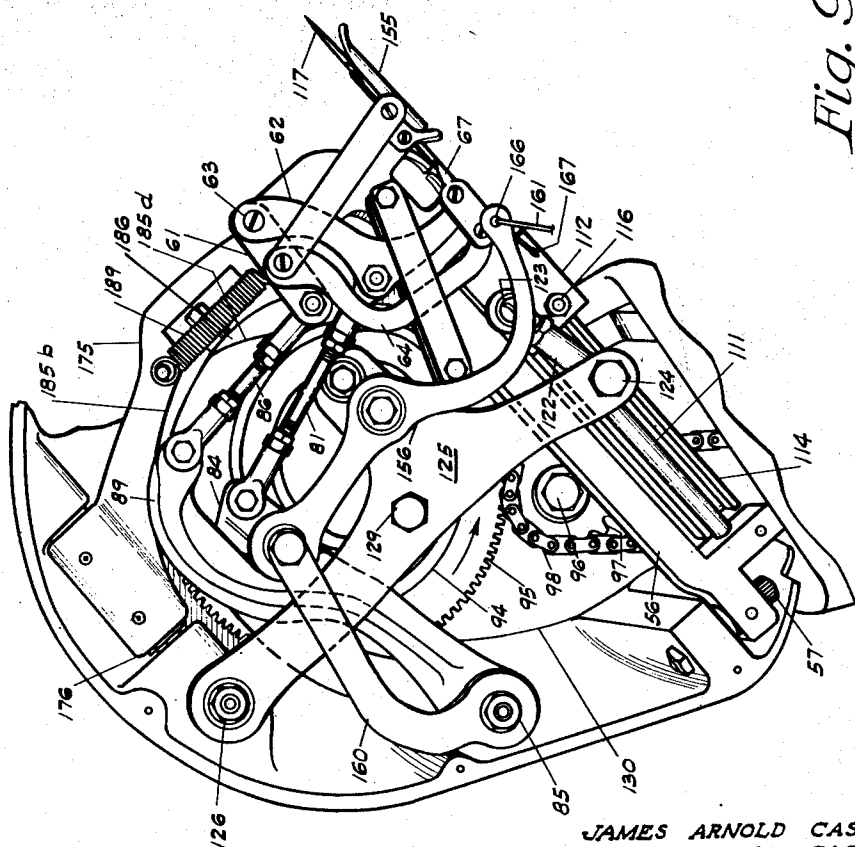


Fig. 8

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8 Sheets-Sheet 4

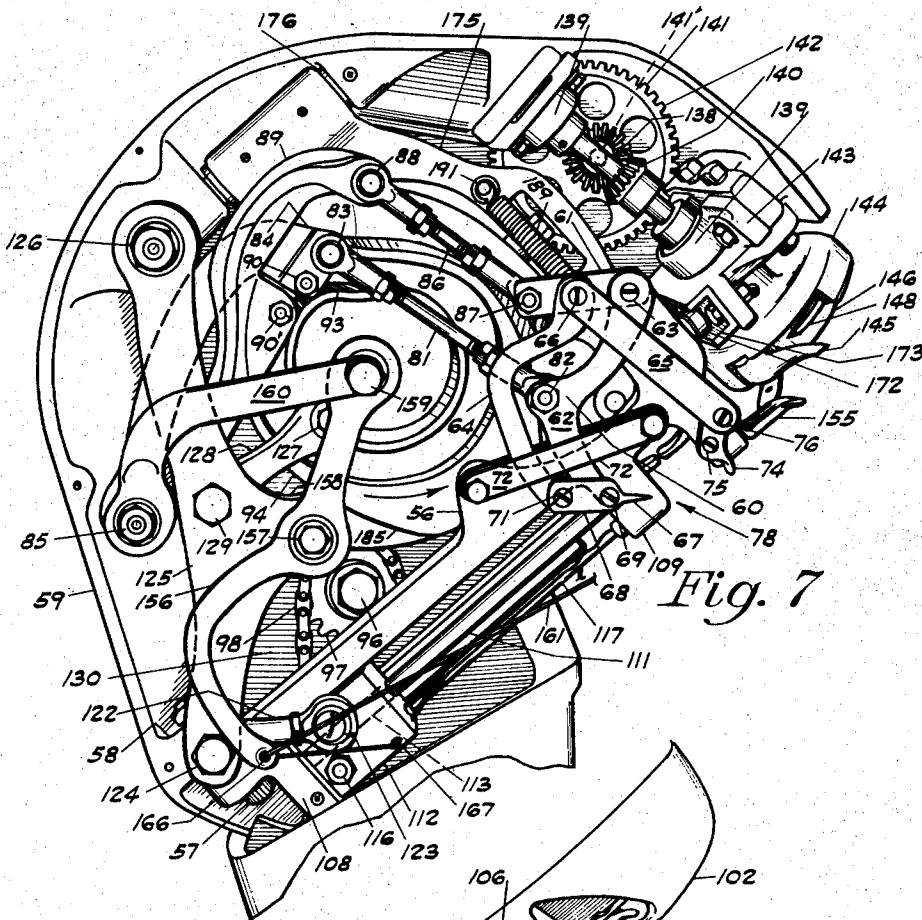


Fig. 7

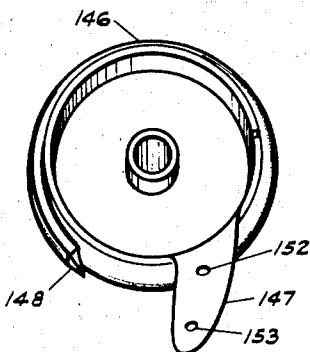


Fig. 13

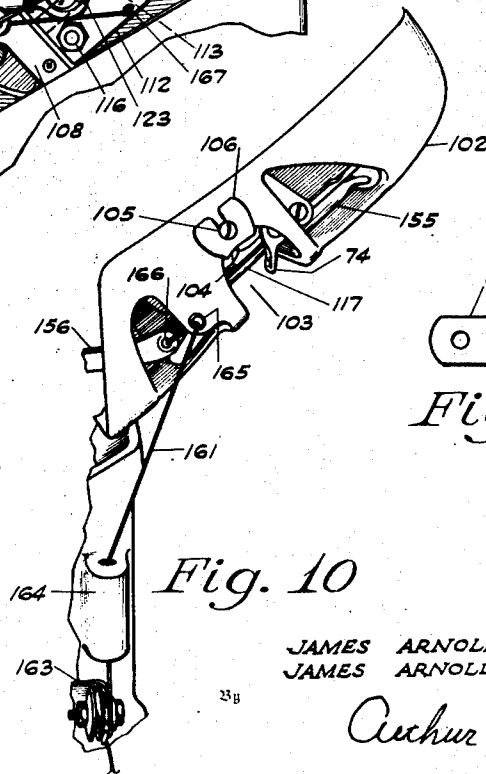


Fig. 10

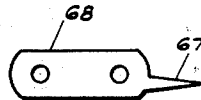


Fig. 14

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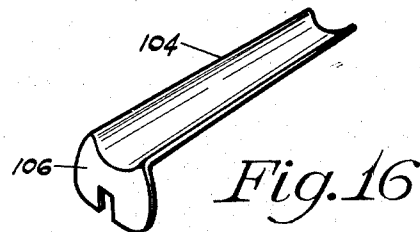
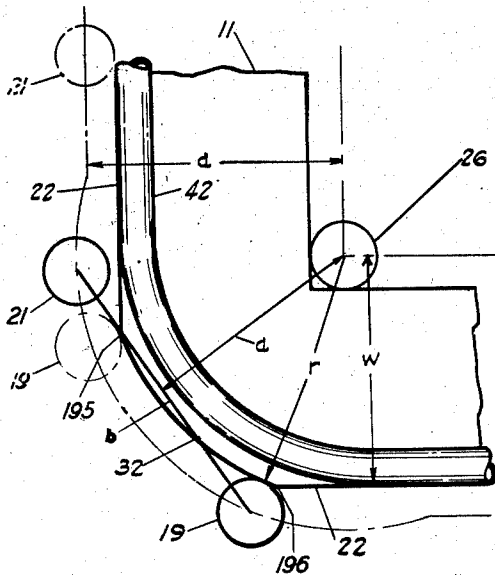
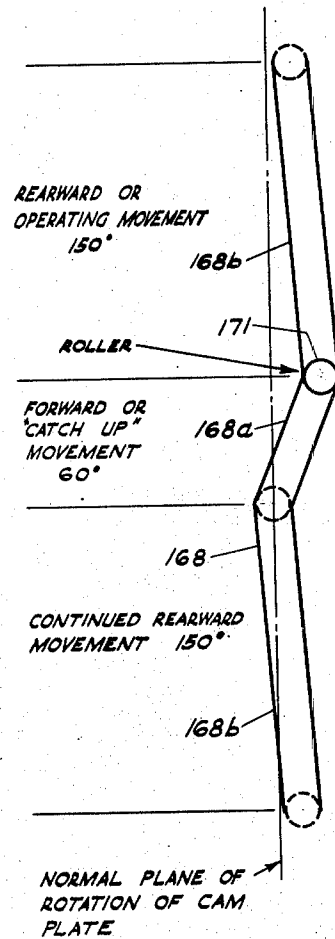
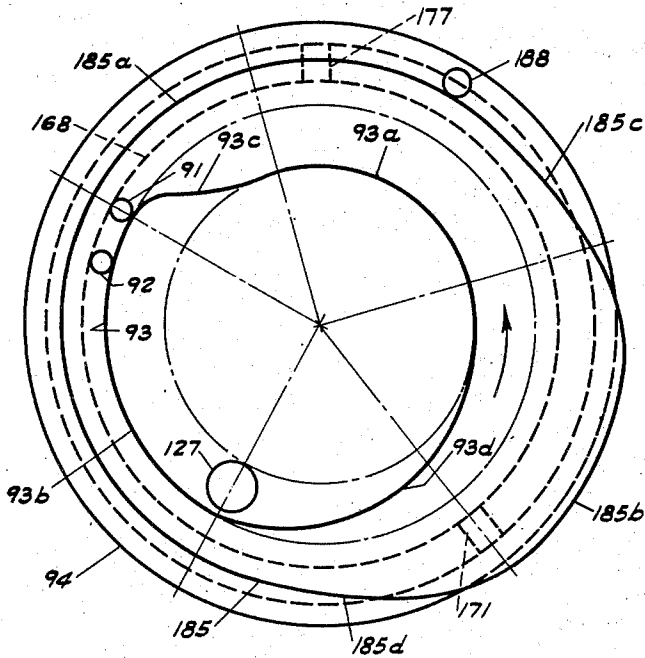
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EDGE ROLL FORMING AND SEWING MACHINE

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EDGE ROLL FORMING AND SEWING MACHINE

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8 Sheets-Sheet 6

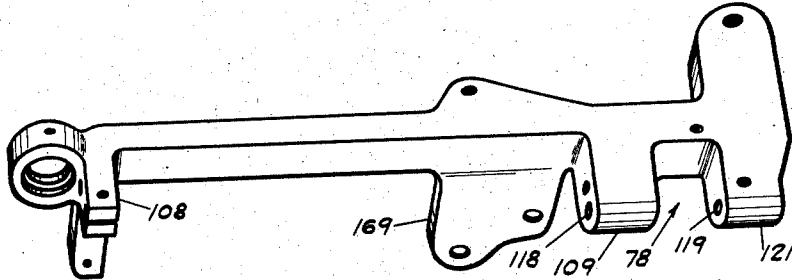


Fig. 17

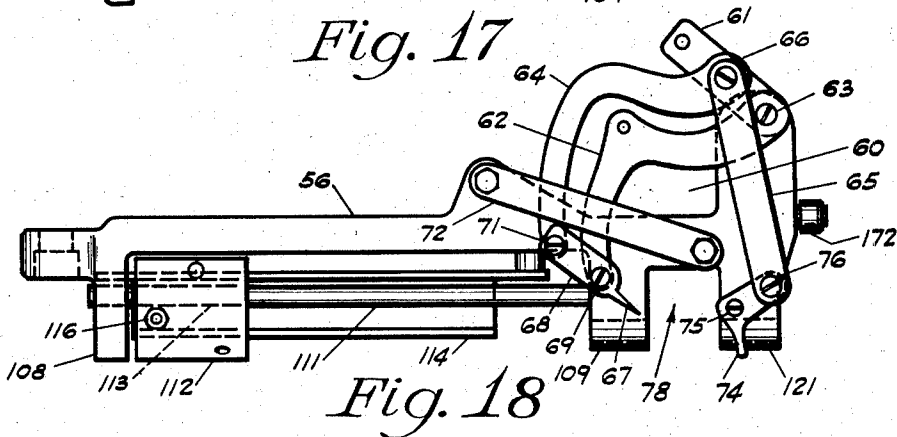


Fig. 18

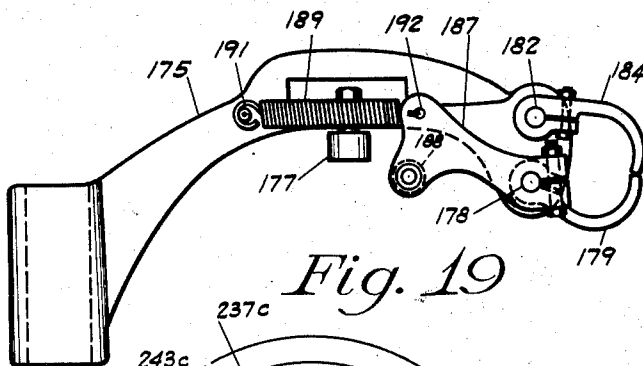


Fig. 19

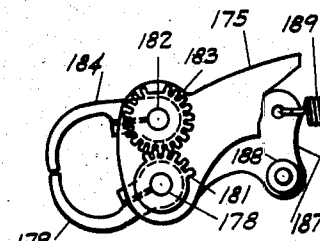


Fig. 20

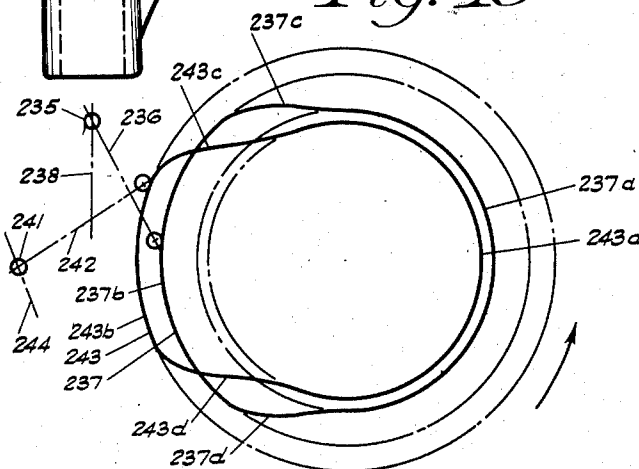


Fig. 27

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8 Sheets-Sheet 7

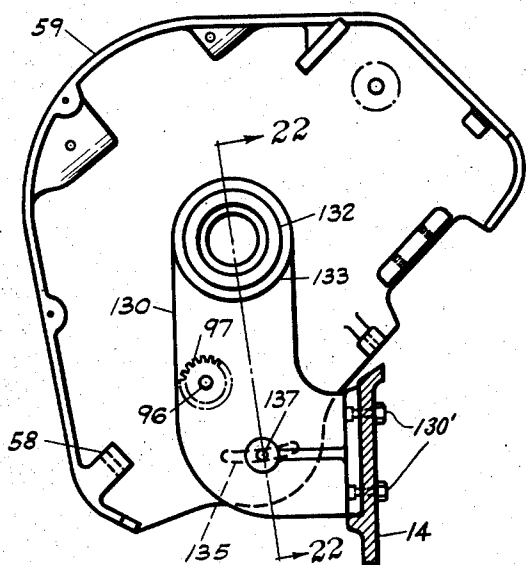


Fig. 21

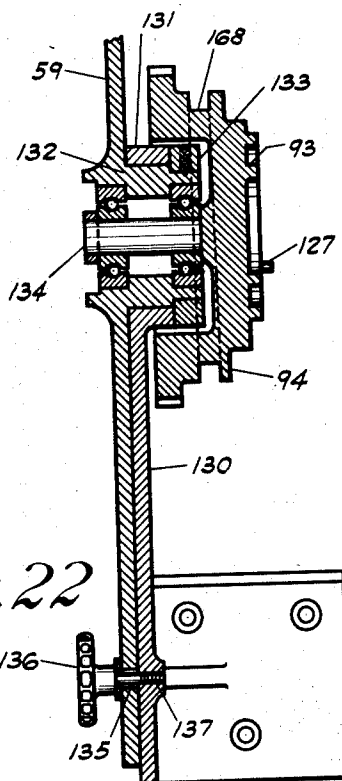


Fig. 22

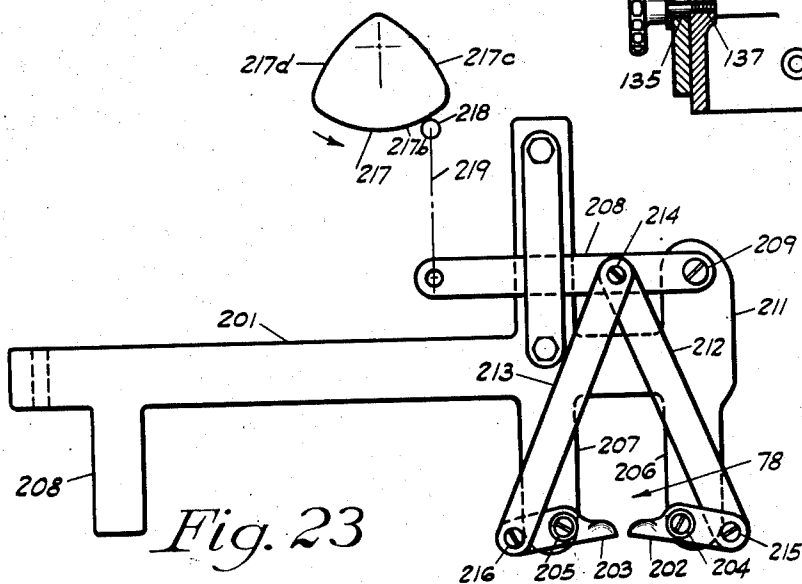


Fig. 23

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8 Sheets-Sheet 8

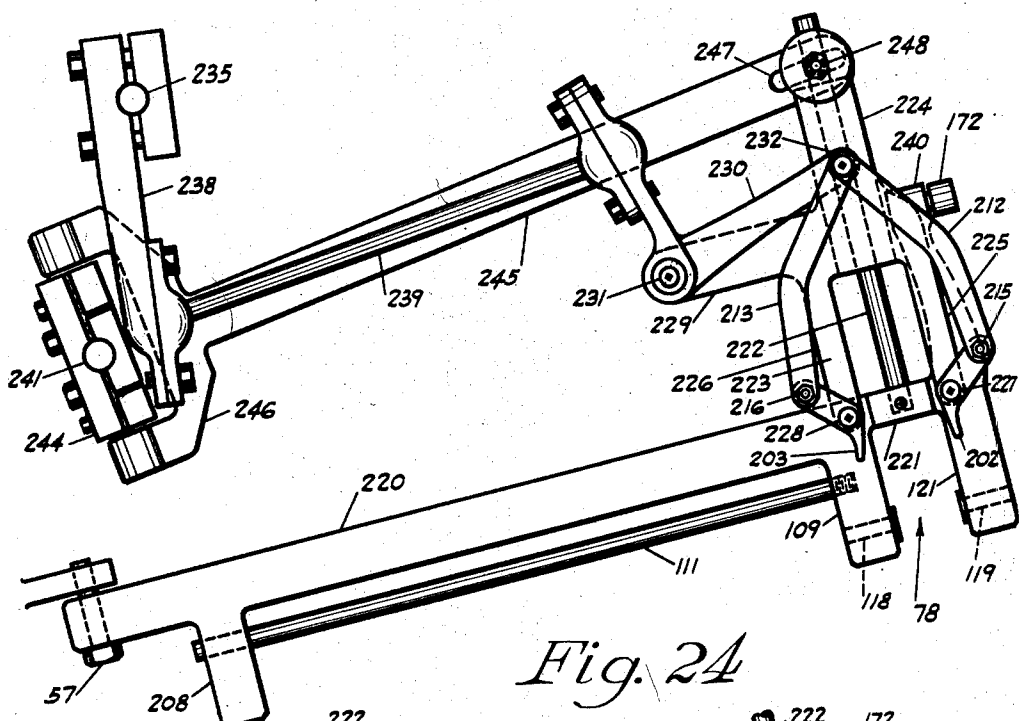


Fig. 24

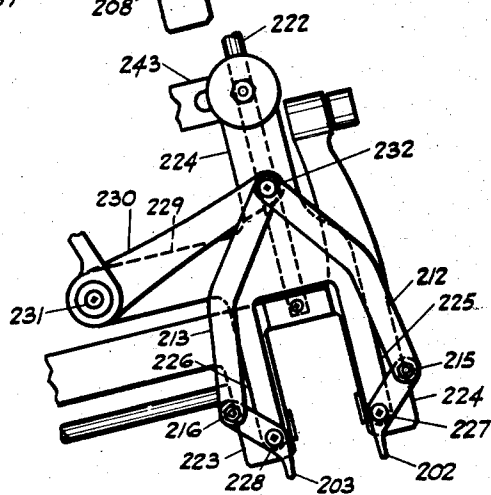


Fig. 25

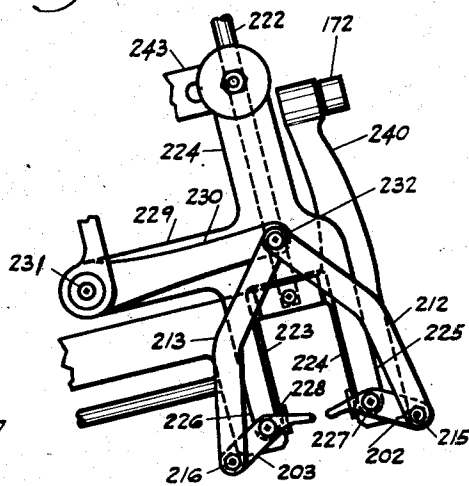


Fig. 26

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UNITED STATES PATENT OFFICE

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EDGE ROLL FORMING AND SEWING
MACHINE

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Kentucky

Application November 17, 1947, Serial No. 786,364

33 Claims. (Cl. 112—3)

1

This invention relates to sewing machines, and relates in particular to machines for forming an edge roll on a mattress or the like and for sewing the roll on the mattress.

Stuffed mattresses consist of an outer covering or ticking filled with loose fibrous material, such as cotton fibers, or the like, and it is usual to gather the ticking and filling material into a roll along the edges and sew the roll along the base to preserve the shape of the mattress. The present invention relates to a machine for automatically gathering the ticking and filling material into a roll at the edge and sewing the roll, although it will be understood that the invention may be employed for operating on other articles in a similar manner.

It is an object of the present invention to provide a combination roll former and stitcher which may be operated at a faster rate than heretofore.

A further object is the provision of a combination roll former and stitcher of simplified construction, whereby the cost of manufacture is reduced.

A further object is the provision of a combination roll former and stitcher which is positively guided to maintain a substantially tangential relation in traveling around a curve.

Another object is the provision of an improved roll forming movement which is of simplified construction.

In accordance with the present invention, there is provided a carriage for roll former and stitcher mechanisms, which carriage can be operated to continuously advance along the article to be operated on for successive roll forming and sewing operations, and on which the sewing needle and roll former are mounted to be moved retrogradely relative thereto while they are in contact with the article, and to be periodically advanced to overtake and assume their starting position in the carriage for the next successive operation. This arrangement and construction avoids the repetitive starting and stopping of the carriage, as heretofore done in prior constructions, and enables the rate of sewing to be increased, partly because the periods of carriage acceleration and deceleration present in the start-and-stop mechanisms of prior constructions are eliminated.

Furthermore, this arrangement enables the simplification of the mechanism. Thus, for example, by mounting the sewing needle and roll former on a single vibrating mount, these elements may be moved retrogradely in unison, and thus only one retrograde actuating mechanism

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can serve to actuate both elements. Further simplification of the mechanism is obtained by mounting the needle for rectilinear sewing movement on the vibrating mount and actuating the needle by a motion varying means including a crank and motion transmitting linkage universally connected to the mount to enable the required vibrating movement for the mount. The roll forming movement carried by the mount also may be universally connected by motion transmitting links to a motion varying cam.

The advancing and retrograde vibration of the mount for the needle and roll former may be accomplished in any suitable manner. We prefer to employ for this purpose a cam which is bodily continuously advanced with the carriage and is rotated in synchronism with the advancing movement, the cam providing a surface inclined from the normal. This cam surface provides a gradually advancing zone and a steep retrograde zone to alternately move the mount backward and forward respectively. Thus, a follower which engages the cam and operates the vibrating mount carrying the sewing and roll forming mechanisms, will move retrogradely when in contact with the advancing zone of the cam, and will advance rapidly when in contact with the steep retrograde zone. By having the mount pivoted on the carriage the mount is oscillated by the cam in properly timed relation to enable completion of a roll forming operation and completion of the penetration and withdrawal stages of the sewing needle during the retrograde phase of the oscillation when there is no relative movement between the article acted on and the roll forming or sewing mechanisms. By providing a quick advancing or overtaking movement, more than half the time between successive stitches can be devoted to the roll forming and sewing operations.

It is preferred to employ a gripper mechanism in conjunction with the sewing mechanism or roll forming mechanism to prevent the article being operated on from being displaced by the advancing movement of the carriage. This mechanism is preferably in the form of a pair of separable gripper jaws or the like which are timed to grip the article and move retrogradely during the period of overtaking movement of the mount, and which are released and advanced at any suitable time thereafter in readiness for the next gripping operation. The back and forth vibration of the gripper, which is out of phase with the vibration of the mount, can be obtained by a follower engaging the cam in displaced relation to the follower for the vibrating mount, and

the gripping and releasing action of the grippers may be timed by a suitable cam surface and follower on the same cam member. If desired, the sewing mechanism may be employed without the roll forming mechanism or any suitable roll forming mechanism may be employed therewith.

The invention further contemplates the provision of an improved and simplified roll forming mechanism which is readily secured to the mount. This mechanism preferably comprises a pivoted linkage having a roll forming element, such as a packing needle, the mechanism having provision for advancing the roll forming element by a substantially lineal movement into the article and for changing the angular relation of the links to turn the roll forming element in the article with a clinching or prying action. The withdrawal of the packing element from clinching position also preferably is accomplished with a substantially lineal or echelon movement, and may be along the same path as the advancing movement. The actuation of the roll forming movement is suitably accomplished by a single cam track carried by the same cam member which vibrates the mount, and a follower or followers connected to the roll former linkage by universal connections are provided to cooperate with the cam track to shift the respective pivots of the roll former movement.

The carriage and mechanism are advanced by a motor which is suitably connected to rotate the cam member in synchronism with the advancing movement of the mechanism. The carriage is advanced by the engagement of a gear on a rack, and the guiding structure for the carriage includes a triangular roller or shoe arrangement engaging parallel guide surfaces along the edge to be sewed and to which the rack may be secured. In turning a corner one of the rollers or shoes acts as a pivot, and the rack is curved about said pivot as a center. The other two rollers, which may be designated as base rollers, are the base of the triangle. The turning radius of the base rollers is the distance between centers of the pivot roller and one of the base rollers, and in turning a corner the base becomes a chord of the turning arc at the corner, the corner of the outer guide surface being cut off to provide turning clearance. By having the sewing needle and roll former aligned parallel to said triangle base, the tangential or normal relation thereof to the radius of curvature is preserved in going around corners.

The invention also includes provision for supporting a mattress to be operated on, with means for raising or lowering the support to accommodate different thicknesses of mattresses, and provision for changing the sewing angle at the edge of the mattress.

The invention embodies various other features, all of which will be described in greater detail in connection with the accompanying drawing, wherein is shown preferred embodiments of the invention by way of example, and wherein:

Figure 1 is a perspective view of the entire invention,

Figure 2 is a fragmentary side view showing the advancing and guiding arrangement,

Figure 3 is a view similar to Figure 2 with additional parts removed,

Figure 4 is a view of the traveling carriage as seen from the right in Figure 1, and with parts of the housing broken away,

Figure 5 is a detail of the guiding roller as seen from the right in Figure 2,

Figure 6 is an enlarged view of the upper portion of the carriage as seen in Figure 4 with the cowl removed to show the interior,

Figure 7 is a side view of Figure 6 as viewed from the left and showing the parts in corresponding position,

Figure 8 is a side view similar to Figure 7 with the shuttle broken away and the parts in an advanced position,

Figure 9 is a view of Figure 8 as seen from the right and including the shuttle,

Figure 10 is an enlarged side view of a fragment as seen in Figure 1, and showing the cowl and roll shaper,

Figure 11 is a partly diagrammatic view of the cam member as seen in Figure 7,

Figure 12 is a diagrammatic end view of the cam showing how the advance and retrograde movement is produced,

Figure 13 is a perspective view of the bobbin housing,

Figure 14 is an enlarged view of the packing needle and shank,

Figure 15 is a diagrammatic view illustrating the operation of the guide in turning a corner,

Figure 16 is a perspective view of the roll shaper bar,

Figure 17 is a perspective view of the vibrating mounting bar stripped of attachments,

Figure 18 is a side view of the vibrating mounting bar carrying the roll forming movement,

Figure 19 is a side view of the gripper arm as viewed in Figure 7,

Figure 20 is a fragmentary view of certain details of the gripper bar as viewed from the opposite side of Figure 19,

Figure 21 is a side view showing the mounting of the carriage head on the carriage,

Figure 22 is a sectional view taken on line 22-22 of Figure 21, and showing the cam plate in section,

Figure 23 is a side view of a modified roll former, a cam therefor being diagrammatically shown,

Figure 24 is a side view of a further modification of the roll former.

Figure 25 is a view of a part of Figure 24 showing the roll former in an advanced phase of movement,

Figure 26 is a view similar to Figure 25 showing the roll former in a further advanced phase, and

Figure 27 is a diagrammatic view of the cam operation for the modification of Figure 24.

Work elevating adjustment

Referring to the drawing, Figure 1, there is shown a table or platform 1 adapted to receive a mattress to be stitched, and having angle brackets 2 depending therefrom which have threaded nuts secured to the bottom that receive the threaded posts 3. The lower ends of the posts are suitably rotatably journaled in socket or bearing members 4 carried by a stationary base or support indicated generally at 5, and sprockets 6 are secured to the posts near the bearings. An endless chain 7 passes over the sprockets 6 and over a drive sprocket (not shown) driven by suitable reduction gearing from a reversible electric motor 8, so that upon operation of the motor the threaded posts 3 are rotated in threaded brackets 2 to raise or lower the platform. A suitable manually controlled switch (not shown) is provided to operate motor 8.

Guide for sewing and roll-forming assembly

The base 5 carries a track or rail 11, to the undersurface of which is secured an endless toothed rack 12. A bracket 13 (Fig. 4) carried by the traveling carriage 14 has bosses 15 and 16 which receive the hexagon head spindles 17 and 18, on which are journaled on suitable ball bearings, the surface contacting means in the form of spaced rollers 19 and 21, respectively, adapted to engage the outside face 22 (Figs. 1 to 3) of the rail 11. A slotted arm 23 (Figs. 2 and 5) adjustably secured to bracket 13 by a bolt 24 passed through the slot, carries a spindle 25 which receives a surface contacting means in the form of a roller 26 also suitably journaled on ball bearings. Roller 26 engages the inside face 27 of the rail 11. The engagement of rollers 19, 21 and 26 with the opposite faces of the rail 11 holds the spur gear 28, which is rotatably journaled in the stitcher carriage 14, in engagement with the tooth rack 12, so that when the spur gear 28 is rotated the stitcher is caused to travel along the rail 11 around the platform 1. The effective length of arm 23 may be accurately adjusted by rotation of the set screws 29 which pass through the cross bar 30 of the arm and are threaded into holes 31 in the bracket 13. An arcuate cam 32 (Figs. 1 and 15) is carried at each corner of the rail 11, the purpose of which will be later explained.

Arms 33 and 34 are swivelled on spindles 35 and 36 between extensions 37 and 38 of the bracket 13. The arms rotatably carry at their ends the shanks 39 of clevises 40 that receive the rotatable grooved casters 41. A steadying rail 42 (Figs. 1 to 3) in the form of a circular rod or tube is suitably secured, as by welding, on the upper face of rail 11, and the grooved casters 41 straddle the rail 42. At the bottom the base 5 carries a guide rail 43 (Fig. 1) and a roller 44 journaled on a vertical spindle on the carriage, engages the guide rail 43. The guide rail 43 is curved at the corners. The casters serve to support or suspend the traveling stitcher carriage on the rail 11, while the rollers 19, 21 and 26 engaging rail 11, and roller 44 engaging rail 43, hold the carriage steady in its travel around the rail. The tubular form of rail 42 allows the casters to travel around the bends at the corners without climbing up upon the rail.

Carriage advancing mechanism

A motor 45 (Fig. 4) is carried in the base housing of the stitcher carriage 14, and is connected by a drive 46 comprising a belt and pulleys, to drive the reduction gear box 47. Gear 28 is rotatably journaled on the reduced end of shaft 48 (Fig. 2) extending from the gear box, and has projections or tongues 49 on its underside which mesh with a radially splined clutch collar 50 secured to shaft 48, and which is capable of movement axially of the shaft. A clutch operating shaft 51 carries fingers 52 which engage in a groove 53 in the collar 50, and a suitable spring (not shown) biases splined collar 50 upwardly into engagement with gear 28. By means of a lever 54 secured on shaft 51, the collar 50 may be manually disengaged from gear 28, thus allowing gear 28 to rotate freely on shaft 48. When gear 28 is rotated by motor 45, its engagement with the toothed rack 12 causes the stitcher assembly to continuously travel or advance around the rail 11. By disengaging collar 50 from gear 28, the gear is free to rotate, and the

stitcher may be manually pushed along the rail 11 to any desired location, and upon re-engagement of clutch collar 50, the gear is locked to the motor to be driven thereby. The motor 45 is controlled by a suitable manually operated switch 55 secured to the side of the assembly, which preferably is of the type normally biased to open position, and closed by manual operation. If desired, any other suitable means may be provided to advance the stitcher assembly.

The traveling carriage 14 carries an edge roll forming mechanism and a sewing mechanism which vibrate laterally at a suitable frequency and speed so as to enable the whole carriage to continue to advance during the time either the sewing needle, or roll forming mechanism, or both are in contact with the mattress to be sewed. The roll forming mechanism will first be described.

Roll forming mechanism

A vibrating guide or mounting bar 56 (Figs. 6, 7 and 18) is pivoted by a pivot 57 to an internal boss 58 in the carriage head 59, and at its opposite end carries the roll forming movement indicated generally at 60. This movement comprises an actuating link 61 and a bowed pivot shifting link 62 pivoted to the mount at a common pivot 63. A bowed clinch operating link 64 and a presser finger link 65 of about equal length are pivotally secured to actuating link 61, and may be connected together at a common pivot 66. A roll former element in the form of a gathering point or needle 67 has a shank portion 68 (Fig. 14) by which it is pivoted at 69 to link 62, and the end of the shank portion is pivoted at 71 to the bowed clinch operating link 64. A pair of flat bars 72 are suitably clamped in spaced relation to mount bar 56 to provide a guide slot for the operation of bowed links 62 and 64. The distance between pivot points 69 and 71 in the shank 68 of the roll forming point preferably is slightly less than the distance between the pivot points 63 and 66 in the actuating link 61. Links 62 and 64 may be of equal length between their respective pivots 63, 69 and 66, 71. A roll forming element in the form of a bell crank roll presser finger 74 carried by the mounting bar 56, is pivoted thereto at 75, and the end is pivoted at 76 to link 65. In the position shown in Figure 7 the roll forming packing needle 67 and presser finger 74 are in spread position and are out of engagement with the mattress edge which passes through the C-shaped mouth 78 in the mount bar 56.

A connecting rod 81 of adjustable length is swivelled at 82 by a universal swivel to the middle portion of driver link 62, the opposite end of the connecting rod being swivelled at 83 by a universal type swivel to a curved cam follower arm 84 which is pivoted at 85 to a boss on the carriage head. A similar adjustable connecting rod 86 is similarly swivelled by a universal swivel at 87 to the end of actuating link 61, and at 88 to a cam follower arm 89, which is also pivotally connected at 85 to the carriage head. Follower arms 84, 89 carry rollers 91 and 92 respectively (shown schematically in Figure 11) on stems 90, 90', and the rollers move in the cam groove 93 in the face of motion varying cam plate 94.

Cam plate 94 is suitably journaled for rotation in the casing and carries a spur gear 95 (Figs. 6 and 8). A pinion (not shown) on spindle 96 and in mesh with gear 95 carries a sprocket 97 which is driven by a chain 98 passing over the sprocket and over a driving sprocket 99 (Fig.

4) operated by the power input shaft extending into reduction gear box 47. The cam groove 93 has a circular or dwell section 93a (Fig. 11) of smaller radius, and a circular or dwell section 93b of larger radius, which sections are each about 90° in extent, respectively, and are joined by a connecting groove portion 93c of about 45° in extent, and a spiral connecting retracting portion 93d of about 135° in extent. The portion 93c preferably is concave to reduce vibration in the cam followers.

Operation of roll former

The cam plate 94 rotates in the direction of the arrows shown in Figures 7, 8 and 11. Referring to Figure 8, the packing operation has been completed and the packing needle 67 is ready to withdraw from the mattress. When rollers 91 and 92 (Fig. 11) enter the spiral withdrawing portion 93d of the cam, which is the portion extending from the small radius part 93a to the large radius part 93b, follower arms 84 and 89 move (Figs. 7 and 8) in unison gradually radially outward from the cam center (or to the left) about their pivot 85, and through connection links 81, 86, actuate the packing needle control links 61, 62, 64 to draw the packing needle 67 away from the mattress in a substantially lineal or echelon movement about the pivot 63. The packing needle remains in withdrawn position while rollers 91, 92 are both on the dwell portion 93b of larger radius of the cam. When advance roller 91 enters on the concave portion 93c of the cam, cam follower arm 84 (Fig. 7) swings on its pivot toward the center of the cam, (or to the right) and through connecting rod 81 swings driver link 62 about its pivot 63, thereby increasing the distance between pivots 66 and 69 and causing link 68 and its needle 67 to rotate clockwise about pivot 71 and assume the position shown in Figure 7 ready for ascending movement. Continued rotation of the cam causes roller 92 to enter the connecting portion 93c of the cam, so that links 61 and 62 turn together upwardly about their pivot 63 to cause the packing needle 67 to ascend in a substantially straight line motion into the mattress.

When roller 91 practically reaches the dwell portion 93a of smaller radius on the cam, further forward movement of pivot point 69 is arrested and as trailing roller 92 enters portion 93c of the cam, it pivots link 64 to move pivot point 71 and thus causes counterclockwise rotation of needle 67 about pivot 69 in a prying or clinching movement to pack the material into the corner roll of the mattress. At the same time movement of link 65 closes packing finger 74 externally over the packing needle to substantially the position shown in Figure 8, so as to compress the material at the base of the roll. The roll is maintained compressed while rollers 91, 92 are on the dwell portion 93a of small radius of the cam. The next movement is the withdrawing movement as above described, to repeat the cycle of operations.

It will be understood that the designation of links 62 and 64 as pivot shifting and clinch operating links respectively, is relative, as the roll forming mechanism may be modified so that link 64 becomes the driver or pivot shifting link, the pivot 69 being suitably mounted to be shifted for the clinching movement. Also, in place of the roll forming movement described, any other suitable roll forming movement may be employed.

Roll shaper

As seen in Figure 10, the front cowl or hood 102 provides a slot 103 which is received in the mouth 78 of the mounting bar 56, and a concave bar 104 (Figs. 10 and 16) is located at the base of the slot and is adjustably held therein by a set screw 105 extending through the slotted end flange 106 thereof into the cowl. The edge roll formed by the packer point 67 and finger 74 abuts bar 104, which serves to smooth the roll. The bar 104 can be adjusted toward or from the bottom of the slot upon releasing screw 105, and can be clamped in adjusted position. The adjustment of bar 104 also provides for regulating the thickness of the formed roll therein by the packing needle, the degree of compression of the material in the roll being determined by the depth to which the mattress corner initially is manually fed into the slot or groove 103.

Sewing needle movement

The mounting bar 56 has two extensions 108 and 109 (the latter forming the lower jaw of mouth 78) which carry between them a guide rod 111, and a needle block 112 has a bore 113 therein to receive said guide rod. A track or channel bar 114 (Figs. 6 and 9) also is carried by the bar 56, and a roller 115 suitably journaled on a spindle 116 carried by the block, moves in the track or channel of bar 114. Rotation of the block 112 about guide rod 111 as it reciprocates thus is prevented. Block 112 carries a long grooved sewing needle 117 having an eye at its point, and when the block moves upward along its guides the needle passes through aligned guide bores 118 and 119 (Figs. 9 and 17) in the jaws 109, 121 of mouth 78.

Needle block 112 has a link 122 universally pivoted thereto at 123, and the opposite end of the link is universally pivoted at 124 to one end of pitman 125. The other end of the pitman is universally swivelled at 126 on a suitable boss in the casing. A crank pin 127 (Figs. 7 and 11) in cam plate 94 has one end of connecting rod 128 journaled thereon, and the other end of the connecting rod is pivoted at 129 by a universal pivot to the pitman. The crank pin 127 is located on the cam plate at a predetermined angular relation to the cam track 93. Thus, rotation of the cam plate causes the crank pin and connecting rod to oscillate the pitman 125, which in turn reciprocates the needle block 112 on its guides and causes the needle alternately to penetrate the base of the mattress roll located in the cowl slot 103 and to be withdrawn therefrom. The thread loop in the needle eye is picked up and interlocked with the bobbin thread and the needle movement is synchronized with the action of the roll forming mechanism, all as will hereinafter appear.

Needle angle adjustment

The carriage base 14 has an extension 130 (Figs. 21 and 22) suitably bolted thereto by bolts 130' and carries a boss 131 at its upper end. The carriage head housing has a cylindrical sleeve 132 integral therewith which is rotatably received in the boss and is retained in position by a collar 133 secured on the end. The sleeve 132 is bored to receive the cam shaft 134 which is suitably journaled in ball bearing assemblies therein, and carries the cam plate 94. Near the bottom the head casing is slotted at 135, and a hand screw 136 (Figs. 4 and 22) passing there-

through into a threaded bore 137 in the extension holds the head in adjusted position. By releasing hand screw 136 the head may be rotated in boss 131 to the desired angular position.

The shuttle

A shuttle shaft 138 is journaled in suitable spaced bearings 139 in the casing, and carries a mitre gear 140 in mesh with mitre gear 141 on a transverse spindle 141'. A spur gear 142 is secured on the mitre gear spindle 141' and is in mesh with cam gear 95 by which it is driven. Shuttle shaft 138 passes through a bracket 143, and its outer end carries a shuttle 144 upon which is secured the looper hook 145. The bobbin shell 146 is freely journaled on the shuttle shaft and has a thread finger 147 extending therefrom and has a hook or retainer 148 located in a suitable cut away part of the shuttle. The bobbin thread 149 (Figs. 6 and 9) from the bobbin 151 is strung, through a hole in the bobbin shell and through a suitable spring friction drag on the shell 146 (not shown) and through holes 152 and 153 in the finger. A convex head thumb screw 154 holds the bobbin in the shell 146. A hollow needle guard 155 swivelled on the upper jaw 121 is engaged by finger 147 to keep the finger in proper position, and also serves to prevent finger 147 from getting into the path of the needle.

Thread tension

A thread tensioning arm 156 is pivoted intermediate its ends by a pivot 157 passing through extension boss 158 on pitman 127, and its one end is pivoted at 159 to an end of arm 160. Arm 160 is held at the other end by universal pivot 85. The thread 161 for the needle passes from the supply ball in side cup 162 (Fig. 4) through a friction drag 163 (Fig. 10) of suitable construction and then through a guide 164 and through an eye 165 in the cowl or hood 102, and then through an eye 166 in the end of the tensioning arm, then through an eye 167 in the needle block 112 and thence to the needle eye. Each time the needle moves downward the tensioning arm 156 moving therewith draws the stitch taut and near its final downward movement draws additional thread through the friction drag 163 from the supply ball in readiness for the next upward movement of the needle. On the upward movement of the needle the tension arm moves along upward with the pitman to provide the slack thread for the loop at the eye of the needle.

The looping operation

After the needle 117 and its thread 161 has passed through the base of the mattress roll, the looped thread in the eye of the needle is picked up by the looping hook 145, and as the hook is carried around by the shuttle, the loop is first caught on retainer 148. Continued rotary movement of the shuttle and looper hook 145 twists the needle thread 161 over the bobbin thread 149. The shuttle is rotated at double the speed of cam 94, so that the needle and tension arm is only half retracted by the time looper hook 145 reaches inverted position, shown by dot and dash lines in Figure 6, and the retraction of the tension arm 156 pulls the loop off the looper finger 145 and draws the loop tight over the bobbin thread which extends from finger 147. Movement of the tension arm beyond the needle; block eye draws enough thread from the supply ball to provide thread for the next stitch. The operation of the shuttle and looper being known

in the art, further explanation of the looping operation is not deemed necessary. It is to be understood that any desired type of shuttle or stitch forming mechanism may be employed in place of that illustrated.

Synchronization of sewing and roll forming operations

Referring to Figure 11, wherein the operating cam is diagrammatically shown, the crank pin 127 connected to pitman 125 causes the needle to complete one sewing cycle for each rotation of the cam, and the location of cam rollers 91, 92 on their follower arms is such that the roll forming operation is completed at or before the sewing needle enters the base of the roll. The crank pin preferably is located near the end of the retracting portion 93d of the cam, so that retraction of the roll forming mechanism begins before the sewing needle starts to withdraw from the mattress. The roll forming operation (counting from about the time the packing needle contacts the mattress until it is completely withdrawn from the mattress roll) plus the sewing operation, (counting from the time the needle enters the mattress to about the time it is completely withdrawn therefrom) occupies about 300° of the cam cycle. During the remaining 60°, more or less of the cam cycle, the roll forming and sewing needle are completing their respective cycles of operation in readiness for the next successive operation.

As the stitcher carriage is being moved forward at all times by the engagement of rotating gear 28 with rack 12, it is apparent that during about 300° of the cam movement, covering that period during which either or both the packing needle and sewing needle are in contact with the mattress, these needles must be moved retrogradely relative to the advancing stitcher carriage at the same speed as the forward motion of the stitcher carriage. Or otherwise stated, the packing needle and sewing needle remain in a fixed location in contact with the mattress while the stitcher carriage moves forward, and after contact of the needles with the mattress ceases, the needles are advanced in 60° of the cam rotation (more or less) to catch up with or overtake the stitcher carriage, whereupon they again are moved retrogradely as above described. The mechanism for vibrating the roll forming and sewing movements in this manner now will be described.

Lateral vibrating mechanism

Cam plate 94 has a peripheral warped groove or track 168, and the lateral extension 169 of arm 56 carries a roller 171 operating in the track. A portion of the cam track 168 is sharply warped at 168a out of the normal plane of rotation for an axial distance corresponding to slightly less than the length of a stitch, and has a gradually sloping or retrograde section designated at 168b. The gradually sloping section, which corresponds to the retrograde phase, is about 300° of the periphery, while the sharply warped section corresponding to the overtaking or advancing phase is about 60°. These sections may be varied as desired in the design of the apparatus. As the cam plate rotates, the roller 171 operating in the track 168 laterally oscillates the mount bar 56 back and forth about its pivot 57, and a roller 172 operating in a track 173 (Figs. 7 and 18) in bracket 143 guides and steadies the mounting arm 56. Thus,

while the sewing or packing needles are in contact with the mattress, roller 171 is in the retrograde section 168b of the cam track, and when the sewing needle leaves the mattress and is moving downward, the roller 171 is in the overtaking section 168a of the cam track. The packing needle and sewing needle both are carried by the arm 56 so that a single cam track 168 and roller or follower 171 serve to oscillate the roll forming and roll sewing mechanisms in unison. By maintaining the arc of oscillation of mount bar 56 small in relation to the distance of the mouth 78 from the pivot 57 thereof, the oscillation of bar 56 is practically a reciprocating movement.

The loop of thread through the roll base is being pulled taut by the tension arm 156 while the needle is moving downwardly, which occurs during the time the mount bar 56 is in the overtaking phase of its movement. The overtaking movement of bar 56 thus exerts a forward pull on the mattress through the thread, and a gripper is provided to hold the mattress stationary against this pull. In the preferred embodiment the gripper is carried by the carriage and oscillates in displaced phase relative to the bar 56. The gripping mechanism will now be described.

The gripper mechanism

A gripper arm 175 is pivoted to the carriage head at 176 in overhanging relation to the cam plate 94, and a roller 177 (Figs. 11 and 19) depends therefrom into the cam track 168, whereby the gripper arm is oscillated laterally forward and backward by the cam. The arm 175 is disposed at substantially a right angle to mount arm 56, and the roller 177 is angularly displaced from the roller 171 which governs the oscillation of the sewing and roll forming mechanisms, by about the same angle, namely 90°. Thus, during the whole time that roller 171 is in the advancing section 168a of the cam and is moving arm 56 in its advancing or catching up phase, the gripper arm 175 is moving retrogradely, due to the engagement of its roller 177 in the retrograde portion 168b of the cam track. The gripping action on the mattress occurs during the retrograde action of arm 175 and is timed to include the period of advancing movement of bar 56, as will now be explained.

Gripper arm 175 at its outer end carries a stub shaft 178 (Figs. 19 and 20) journaled therein to which is suitably secured, as by a split clamping portion, the lower curved jaw 179. At its one end stub shaft 178 carries a gear segment 181. A second parallel stub shaft 182, also rotatably journaled in the gripper arm above shaft 178, carries a meshing segmental gear 183 at one end and at its other end is suitably secured the upper curved gripper jaw 184. The biting edges of jaws 179, 184 may be scalloped or serrated to improve their gripping action.

Cam plate 94 has a shoulder which provides a cam surface 185 (Fig. 11) comprising a cylindrical portion 185a and a projected cylindrical portion 185b joined thereto by connecting portions 185c and 185d of any suitable shape. A portion of the cam plate may be relieved at 186 to save material, and the cam track 185 is warped around the relieved portion while maintaining its cylindrical surface. A jaw actuating arm 187, suitably clamped to stub shaft 178, carries a roller 188 at its end, and a helical tension spring 189, stretched between a pin 191 on arm 175 and a hole 192 in actuating arm 187, holds the

roller 188 in engagement with the cam surface 185.

When roller 188 is in engagement with dwell portion 185a of the cam the spring 189 acting through arm 187 and gear segments 181 and 183 maintains the jaws in closed or clamped position on the mattress roll. When roller 188 enters upon the forward portion 185c of the cam extension, the jaw actuating arm 187 is rotated clockwise with stub shaft 178 as its pivot, and by means of meshing gear segments 181, 183 causes both jaws 179, 184 to open and release their hold on the mattress. The jaws remain in open position until the roller 188 passes over the dwell portion 185b, and start to close when the roller enters the connecting portion 185d of the cam, and are maintained closed while the roller traverses the dwell portion 185a of the cam.

The portion 185b of the cam is about 60° in extent and is timed to engage roller 188 during the advancing portion of the cycle of operation of gripper arm 175 and acts on roller 188 during the time the sewing needle is in engagement with the mattress, and while the mount bar 56 is moving retrogradely.

Corner turning operation

Referring to Figures 1 to 5 and 15, it will be observed that rollers 19, 21 and 26 form a triangle, and the rollers are guided for parallel movement by rail 11. When apex roller 26 reaches a corner of rail 11 so that it cannot advance further in a straight line, it holds the pivot position at the corner, while gear 28 engages the corner arcuate portion of rack 12, which is curved about the apex roller as the center to drive the carriage around the corner. Advance base roller 19 therefore commences to describe a circle at the point 195 about the apex roller as its center, as shown by the dot and dash circle, and the outside corner of the rail 11 is cut away at the point where the base roller commences its arcuate movement. This cut away portion 32 preferably is formed as a curve about the apex roller as the center and meets the straight portion of the rail at 195 and 196 so as to provide an engaging surface for roller 19, although the surface 32 may be angular, if desired. Trailing roller 21 at the same time also commences to describe a circle on the same radius and leaves the track surface 22 until its course brings it to point 195 where it engages curved surface 32.

When roller 19 reaches the point 196 it leaves the rail surface 22 in its arcuate path. Although in describing the turn either or both rollers 19, 21 may leave the track surface 22 or curved surface 32, the carriage is held steady by the engagement of gear 28 on rack 12 as it advances the carriage around the corner. When trailing roller 21 reaches the point 196, the pivot roller gives up its pivot position and advances along rail 11 at right angles to its approach path. The base line *b* between the centers of rollers 19, 21 is a chord of the turning circle, and the altitude of the triangle is designated at *a*. The radius of curvature of surface 32 is longer than the distance *w* between outer surface 22 and the center of apex roller 26.

The altitude line *a* lies on a radius of the turning circle and by timing the sewing needle movement so that the needle enters the roll while it is substantially coincident with the altitude line *a*—that is, the normal plane through which the altitude line passes—the penetration points of the stitches at the corners of the mattress will lie on a circle, and the stitches will be chords thereof.

If the sewing needle is located to penetrate at the base of the altitude line *a*, or between the base and the apex, the stitch spacing at the corners will be slightly shorter than on the straightaway. By locating the needle to penetrate on the external extension of line *a*, the stitches may be made the same length or longer than on the straightaway. The imaginary line between the sewing needle and the packing needle in mouth 78 may make any suitable angle to the radius line *r*. However, by having this imaginary line perpendicular to radius line *r*, a tangential relationship to the stitch circle will be maintained in going around the corners. Such a relationship generally is desirable.

Operation of complete apparatus

The operation of the entire apparatus now will be described. A mattress to be stitched is placed upon the table 1 which is raised or lowered as required by suitable operation of motor 8 to bring the upper edge thereof on a level with the slot 103 in the cowl 102. The mattress then is positioned by the operator with its edge parallel or coincident to the edge of the table and engaging roll shaping bar 104. The thickness of the roll may be adjusted by adjusting the depth of roll shaping bar 104 in the slot 103 and clamping it in adjusted position by screw 105. The carriage head 59 may be turned as desired in the boss 131 to adjust the angle at which the needle enters the side of the mattress, and is locked in adjusted position by tightening the clamping screw 136. Because all the pivot mounts 57, 85, 126 and 176 are on the casing, rotation of head 59 does not affect the phase relation of the various cam followers relative to each other. That is, rotation of head 59 shifts all parts cooperating with the cam in unison. A sufficient length of the bobbin and needle threads 149, 161 are drawn out and held by the operator, and the apparatus is ready to begin operation.

Beginning with the apparatus in the position shown in Figures 6 and 7, the sewing needle 117 is shown retracted, and the packing needle 67 has been turned in readiness for upward movement. Movement of concave cam portion 93c (Fig. 11) under rollers 91, 92 pivots links 62, 64 counterclockwise about pivot 63 and advances the packing needle 67 into the side of the mattress in a substantially straight line movement. Then, coincident with the clinching movement of packing needle 67, the presser finger 74 moves inward toward the mattress and holds the roll in position against the roll shaper bar 104. The sewing needle now penetrates the base of the roll while the rollers 91, 92 on the dwell portion 93a of the cam hold the packing needle and presser finger stationary. During this phase of the operation the whole mounting bar 56 carrying the roll forming and sewing elements, is moving retrogradely, and the gripper jaws 179, 184 have engaged the mattress roll in the position shown in Fig. 9. The looper hook 145 catches the loop in the eye of the needle and moves around to inverted position, shown in dot and dash lines in Fig. 6. The packing needle withdraws from the roll in an arcuate parallel movement, and by providing a relatively long withdrawing period for the packing needle, deviation from a straight line movement while the needle is in the roll is not of consequence. Then the sewing needle is retracted and the retracting tension arm 156 pulls the loop off of the looper hook 145. The mounting bar 56 now quickly completes its overtaking or advance movement while the gripper jaws continue to hold the mattress

edge and continue their retrograde movement as shown in Figure 6.

The continued downward movement of tension arm 156 pulls taut the needle thread, which has been twisted over the bobbin thread, and as the eye 166 thereof passes the eye 167 in the needle block in its downward movement, additional thread is drawn from the supply ball for the next stitch. When the packing needle reaches the position shown in Figure 18 the rollers 91, 92 on cam 94 turn the needle to the position shown in Figure 7 ready for the next ascending movement, while the grippers are still moving retrogradely but are near the end of their retrograde movement. When the packing needle enters the mattress edge at an advanced position, the grippers release the mattress roll and make a quick advance movement to the position shown in Figure 9 ready for retrograde movement, and the roll forming and sewing cycle as above described is repeated. When the carriage rounds a corner of the mattress about the center of apex roller 26, the sewing needle is always substantially on a radius, and the line between the sewing needle and roll packing needle is tangential to the stitch circle or arc.

Because it is not necessary to start and stop the whole sewing and roll forming mechanism each time a stitch is made or a section of roll is made, the operation of sewing is greatly accelerated. In addition, by operating or timing the mechanisms from a single source, which is the cam plate 93, the mechanism is greatly simplified.

Modifications

In Figure 23, is illustrated a modified form of roll former, which is particularly adapted for use on mattresses employing a light weight ticking. The modified oscillating mount bar 201, which replaces mount bar 56 in the carriage, carries a pair of bell crank presser fingers 202 and 203 pivoted at 204 and 205 to the jaw members 206 and 207 thereof. These fingers engage the side and top of a mattress along the edge in the roll forming operation. An actuating arm 208 (corresponding to arm 61) is pivoted at 209 at one end to an extension 211 of the mount bar, and a pair of connecting links 212 and 213 corresponding respectively to links 65 and 64, extend from a common pivot 214 at an intermediate part of arm 208 and are pivotally connected at 215 and 216 to the ends of presser fingers 202 and 203 respectively. In the sewing operation, the needle passes through aligned holes in jaw members 206, 207.

A cam track 217 replaces the track 93 and has a dwell portion 217b of large radius, and finger opening and closing portions 217c and 217d. A roller 218 is carried on a suitable single cam follower which is connected by a link 219 to the end of actuating arm 208 by a universal connection. The cam, follower and connecting link are diagrammatically illustrated in Figure 23, and the center of rotation of the cam track 217 is diagrammatically indicated by the crossed dot and dash lines. The needle block and guide therefor carried by mount bar 201 are constructed and operated substantially as shown in Figures 7 and 18.

When the cam roller 218 is on the dwell part 217b of the cam track, the roll is being held compressed by the fingers 202, 203 in the position shown in Fig. 23, while the sewing needle enters the roll, has its thread loop picked up by the

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looper, and then withdraws from the roll. When the cam roller is on the portion 217d of the cam, the actuating arm 208 is being swung clockwise about the pivot 209 thus withdrawing the presser fingers 202 and 203 from the roll.

When the cam roller 218 is on the portion 217c of the track, the actuating arm 208 is swung counter clockwise about its pivot 209, thus rotating finger 202 clockwise and finger 203 counterclockwise about their respective pivots 204, and 205 to roll compressing position. In this modification, the presser fingers, which constitute the roll forming elements, each have a rotary-clinching motion only and retract from the roll base through substantially the same rotary path of movement that they take in forming the roll, except, of course, that the direction of movement is reversed. If desired, the cam may have a dwell portion of suitable extent between portions 217d and 217c thereof.

In Figures 24 to 27, the modified mount bar 220 has a block 221 extending forwardly between the extensions 109, 121 constituting the mouth 78, and a guide rod 222 is suitably mounted therein. A yoke member 223 has a sleeve 224 which is slidable on the guide rod so that the yoke is capable of reciprocation thereon. The legs 225, 226 of the yoke have the roll forming elements 202, 203 pivoted thereon at 227 and 228 respectively, and connecting links 212, 213 are pivotally connected at their ends thereto at 215 and 216. An extension 229 on the yoke carries a bell crank lever 230 pivoted thereon at 231, and the links 212, 213 are pivotally joined together at 232 on one arm of the bell crank. Rotation of the bell crank 230 about its pivot 231 thus oppositely rotates the bell crank presser fingers 202, 203 in the roll forming operation.

A shaft 235 journaled in the housing carries a cam follower 236 diagrammatically shown in Figure 27, which cooperates with a suitably shaped cam 237 that times the oscillation thereof, and a crank arm 238 (Figs. 24 and 27) is carried by this shaft. A rod 239 suitably adjustable in length connects arm 238 with bell crank 230. Rod 239 is secured by universal connections to cranks 238 and 230 so as to allow yoke 223 to oscillate with mount bar 220. The roller 172 carried on a suitable extension 240 of the mount bar operates in a suitable track to guide the mount bar in its advancing and retrograde oscillation.

A shaft 241 suitably journaled in the housing carries a cam follower 242 diagrammatically shown in Figure 27 which cooperates with a second cam 243 that times the oscillation thereof. A block 244 with trunnions on its end is carried by shaft 241, and an arm 245 has a yoke 246 at one end journaled on the trunnions.

The opposite end of arm 244 has a slot 247 which receives the pin 248 secured in sleeve 224. Oscillation of shaft 241 upon its axis thus causes the yoke 223 to reciprocate upon guide rod 222, carrying with it the bell crank 230, the slot and pin connection 247, 248 allowing for the angular differential movement between arm 245 and pin 248. The pivotal connection of yoke 246 on the block 244 allows the arm 245 to oscillate with mount bar 220 in its retrograde and overtaking movements, and the universal connections of rod 239 with cranks 238, 230 also permits such oscillation without substantially displacing crank 230. The sewing needle may be operated in any suitable manner.

The operation of this modification is as fol-

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lows: The mount bar 220 carrying the above described roll former elements and the reciprocating sewing needle is oscillated with a retrograde and overtaking movement like mount arm 56. The timing cams 237, 243 have suitably shaped portions to oscillate shafts 235, and 241 for effecting movement of the roll forming elements. As shown in Figure 24, the yoke 223 is ready to move into roll forming position, and the corresponding cam positions and follower arrangements therefor are diagrammatically shown in Fig. 27. Follower 236, is on the dwell portion 237b of larger radius of cam 237 and follower 242 is on the dwell portion 243b of larger radius of cam 243. When follower 242 enters connecting portion 243c of the cam it turns shaft 241 clockwise and through arm 245 moves the yoke 223 downward along guide rod 222 to the position shown in Figure 25. Because of the universal ball and socket joint connection of rod 239 with cranks 238 and 230, and because rod 239 joins crank 238 close to pivot shaft 241, movement of the yoke occurs without substantial rotation of bell crank 230. The roll forming fingers 202, 203 thus are moved in a substantially rectilinear path into engagement with the mattress. Follower 242 now enters on dwell portion 243a of smaller radius of the cam 243, to hold the yoke in this position.

Now, follower 236 comes off of dwell portion 237b of larger radius of cam 237 onto connecting portion 237c and thus turns shaft 235 counter clockwise, which in turn through rod 239 turns bell crank 230 clockwise. This moves the common pivot 232 of links 212, 213, downward to the position shown in Figure 26, thus rotating the fingers 202, 203 about their pivots 227, 228 to form and compress a roll at the edge of the mattress. The fingers, 202, 203 are held in this position while followers 242 and 236 engage the cam dwell portions 243a and 237a respectively of smaller radius.

After the sewing needle enters the base of the roll and is withdrawn, for example, as explained in connection with the previously described modifications, the followers 236, 242 simultaneously have reached the connecting portions 237d and 243d respectively, and simultaneously turn the shafts 235 clockwise and 241 counter clockwise. This causes arm 245 to raise yoke member 223 at the same time that arm 239 rotates crank 230 to move common pivot 232 and cause roll former elements 202, 203 to be reversely rotated in the withdrawing movement to clear the compressed edge roll. That is, the pivot points 227, 228 of the roll former elements are being moved at the same time that the elements 202, 203 are being rotated about these pivot points. Thus in the retracting movement the ends of the roll forming elements describe a cycloid path which moves them clear of the compressed roll in one continuous movement.

It will be observed that in this modification the roll former fingers 202, 203 have only three movements, namely, a rectilinear movement which brings them into engagement with the mattress, a rotary or clinching movement which gathers and compresses the material of the mattress into a roll, and a cycloidal releasing or retracting movement. By reducing the roll forming movement to three such motions the construction and operation is greatly simplified. If desired, one or both of the presser fingers 202, 203 in this modification may be replaced by packing needles. The timing cams for shafts 235, 241

have suitable dwell portions so as to determine the duration of the various movements or phases of the roll former. During the contact of the roll former or needle with the mattress the mount bar 220 is moving retrogradely, and the retraction of the roll former occurs at a suitable period in the overtaking movement of the mount bar.

Although the roll forming movements herein described are employed in connection with an oscillatable mount for retrograde and overtaking movement, it is to be understood that they may be employed, if desired, in the conventional starting and stopping carriage mechanism of the prior art, with corresponding benefits. Various other modifications may be made without departing from the spirit or scope of the invention.

Having described our invention, we claim:

1. In an apparatus of the character described, the combination of: sewing means intermittently engaging an article to pass a needle into said article; a supporting carriage for said sewing means; means for continuously advancing said carriage; means providing relative movement between said carriage and sewing means to allow said sewing means to remain substantially stationary in contact with said article while said support is advancing, and means for periodically advancing said sewing means relative to said carriage while out of engagement with said article for successive operations on said article.

2. In an apparatus of the character described, the combination of: a sewing mechanism; a supporting carriage therefor; means for continuously advancing said carriage for successive operations on said article; and means providing vibrating movement between said carriage and sewing mechanism to allow said mechanism to remain substantially stationary in contact with said article, while said support is advancing and to periodically advance said mechanism while out of engagement with said article.

3. An apparatus as specified in claim 2 having a looper mechanism movable with said carriage, and wherein said sewing mechanism includes a needle having a sewing movement transverse to the path of movement of the carriage.

4. In an apparatus of the character described, the combination of: a supporting carriage; a sewing mechanism pivoted on said carriage for intermittently engaging an article to pass a needle therethrough; means for continuously advancing said carriage for successive operations on said article, and means providing synchronized vibrating movement of said sewing mechanism on said carriage to allow said sewing needle to remain stationary in contact with said article while said support is advancing.

5. In an apparatus of the character described, the combination of: a roll forming mechanism; a sewing mechanism; a carriage therefor; a stationary support for said carriage; means for advancing the carriage along the support for successive operations on an article; and means providing vibrating movement between said carriage and mechanisms to allow said mechanisms to remain substantially stationary in contact with said article while said support is advancing and to periodically advance said mechanisms while out of engagement with said article.

6. An apparatus as specified in claim 5 wherein the advancing movement of said mechanisms is less than half of the operating cycle.

7. In an apparatus of the character described, the combination of a sewing mechanism; a carriage for said mechanism; means for continuously

advancing said carriage; means for vibrating said mechanism to maintain it in stationary relation in contact with an article being sewed while said carriage is advancing; means for gripping said article during the time said sewing mechanism moves out of engagement with said article in the direction of movement of said carriage; and means for moving said gripping means retrogradely during the gripping operation.

8. An apparatus as specified in claim 7 wherein said carriage carries a roll forming mechanism vibrated in unison with said sewing mechanism.

9. In an apparatus of the character described, the combination of: a roll forming mechanism intermittently engaging an article to form a roll thereon; a carriage for said mechanism; means for continuously advancing said carriage; means providing relative movement between said carriage and roll forming mechanism to allow said roll forming mechanism to remain substantially stationary in contact with said article while said carriage is advancing; and means for periodically releasing and advancing said roll forming mechanism for successive operations on said article.

10. In an apparatus of the character described: a movable carriage; a rail providing a pair of spaced guiding surfaces having angularly disposed portions; a cylindrical guide track carried by the rail along its length; a pair of swivelled grooved casters carried by said carriage and operating on the track to support the carriage on the rail; contact members carried by the carriage comprising a pivot member engaging one of said surfaces and a pair of base contact members engaging the other of said surfaces; a cut away surface portion joining the angularly disposed portions at the points of departure of the base member from the guide surface in rounding the corner whereby said carriage can turn the corner at said angularly disposed portions about the pivot member as the center.

11. A roll forming mechanism for a mattress comprising a pair of roll forming elements, adapted to engage the mattress, at least one of said elements being a blunt finger; means pivotally supporting said elements; means for moving said pivotal support to bring said elements into engagement with a mattress; means for oppositely turning said elements in their moved position to form a roll; and means for simultaneously withdrawing and reversely turning said blunt finger out of engagement with said roll in a cycloid path; and means for simultaneously withdrawing said other element.

12. A roll forming mechanism comprising a pair of links pivoted on a common fixed pivot, a roll forming point pivoted to the end of one of said links, means to oscillate the one link, and a connecting link pivoted at one end to the other link and at the other end to the roll forming point.

13. An apparatus as specified in claim 12 having means connected to each link of said pair of links for independently moving said links about said common pivot.

14. An apparatus as specified in claim 12 having a presser finger located to cooperate with said roll forming point, and a link connecting said presser finger to one of said pair of links.

15. A roll forming mechanism comprising a pair of links pivoted on a common fixed pivot; a roll forming point pivoted to one of said links; a connecting link pivoted to the other link and to the roll forming point whereby the roll forming point is carried by said links; a presser finger pivotally mounted to cooperate with said roll

forming point; and a link pivoted to the presser finger and to said connecting link.

18. An apparatus as specified in claim 12 having a carriage; a mounting bar carried thereby for vibrating movement, and in which said fixed common pivot is carried on said mounting bar.

17. In an apparatus of the character described; a carriage; means for advancing said carriage; a mounting bar on said carriage; a roll forming mechanism carried on said bar; a sewing needle carried on said bar, means for actuating said sewing needle and roll forming mechanism; and means for vibrating said bar with a retrograde and overtaking motion.

18. An apparatus as specified in claim 17 in which said actuating means includes motion varying means mounted on said carriage, and motion transmitting links universally connected to said roll forming mechanism and sewing needle.

19. An apparatus as specified in claim 17 in which said actuating means comprises a cam member having a cam surface for actuating the roll forming mechanism and a crank for operating said needle.

20. An apparatus as specified in claim 17 wherein said bar vibrating means comprises a warped cam surface on said cam member and said bar has a follower engaging said warped cam surface.

21. An apparatus as specified in claim 17 in which said actuating means comprises reciprocating means for said needle; means mounted on said bar for guiding a needle for reciprocating movement; a crank member; and motion transmitting links between said crank and needle including a universally pivotal connection.

22. An apparatus as specified in claim 17 having article gripping means vibrated in displaced phase relative to said bar, and means for actuating said gripping means.

23. A clamping assembly comprising a pivoted arm: a pair of clamping elements pivoted on said arm, means connecting said elements for opposed pivotal movement, an actuating arm connected to one of said elements, cam means engaging said latter arm to pivotally operate said clamping elements, and means to oscillate said first arm.

24. In an apparatus of the character described: a carriage; a cam member journaled for rotation on said carriage; a mount bar pivoted to said carriage and engaging said cam to be actuated thereby; a sewing needle mounted on said bar; means on said cam for operating said sewing needle; a roll former on said bar; means on said cam for operating said roll former; a gripper member mounted on said carriage; means on said cam for actuating said gripper member; and means on said cam for vibrating said gripper member out of phase with said bar.

25. An apparatus as specified in claim 24 having a head pivotally mounted on said carriage, and wherein said bar, and gripper member are mounted on said head.

26. In an apparatus of the character described; a sewing head; a mount bar on said head carrying a needle reciprocating mechanism; a rotary shuttle carried by said head; a bobbin casing in said shuttle having a finger extending therefrom; means for vibrating said mount bar and a guard for said needle on the mount bar engaged by said finger.

27. An apparatus as described in claim 26 wherein said finger carries the thread from the bobbin.

28. In an apparatus of the character described; a movable carriage; guiding means therefor providing a pair of spaced guiding surfaces having

angularly disposed portions; contact members carried by the carriage comprising a pivot member engaging one of said surfaces and a pair of base contact members engaging the other of said surfaces; a gear rack curved about the angular portion with said pivot member as the center, a gear on the carriage in engagement therewith for advancing said carriage, said guiding means having an exterior corner portion removed to allow the base members to pivot about the pivot member at the corner, on the pivot member as the center of turning.

29. A roll forming and stitching mechanism comprising: a support for an article upon which a roll is to be formed and stitched; a carriage arranged for movement along said support in operative relationship to an article thereon; drive means for moving said carriage substantially continuously; a roll forming mechanism for repeatedly engaging and releasing said article and operative, during successive engagements, to form successive portions of said article into a roll; a sewing mechanism for repeatedly engaging and releasing said article when it is respectively engaged and released by said roll forming mechanism and operative, during successive engagements, to stitch successive portions of said roll as it is formed; a head carrying said forming and sewing mechanisms; means mounting said head on said carriage for forward and rearward movement relative to the direction of movement of said carriage; and means for moving said head rearwardly relative to the carriage as the carriage moves forward during the engagement period of said forming and sewing mechanisms and for moving said head forward relative to the carriage as the carriage moves forward during the releasing period of said mechanisms.

30. The mechanism of claim 29 wherein: said head is pivotally mounted on said carriage for swinging movement forwardly and rearwardly relatively to said carriage.

31. A sewing mechanism including means to move a needle carrying a thread through an article to be sewed; a supporting carriage for said sewing mechanism; means for continuously advancing said carriage; and means vibrating said needle moving means back and forth along the path of advance of said carriage in synchronism with the in-and-out movement of the needle to allow said carriage to advance while the needle is in contact with the article to be sewed.

32. A roll forming mechanism comprising: a pair of cooperating roll forming blunt fingers pivotally mounted upon a support member; means guiding said support member for rectilinear movement toward and away from the article to be formed; means to advance said support member; means pivotally connected to said fingers for oppositely turning said fingers adjacent the advance limit of movement of said support member into engagement with the article to be formed; and means for simultaneously retracting said support member and said latter means at different speeds to reversely turn and withdraw said fingers out of engagement with said article.

33. A roll forming mechanism comprising: a support having an opening therein for receiving the edge of a mattress; a link mounted on a fixed pivot on said support; a roll forming element pivotally mounted at one end of said link; a second roll forming element mounted on a fixed pivot on said support adjacent said opening; a pair of links pivotally connected together at a common pivot at one end and pivotally connected

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to said roll forming elements at the other respective ends of said pair of links; and movable means carrying said common pivot for turning said fingers.

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