March 5, 1968 J. A. CASH, JR 3,371,630

BORDER PANEL MANUFACTURING MACHINE

Filed Feb. 25, 1966 3 Sheets-Sheet 1

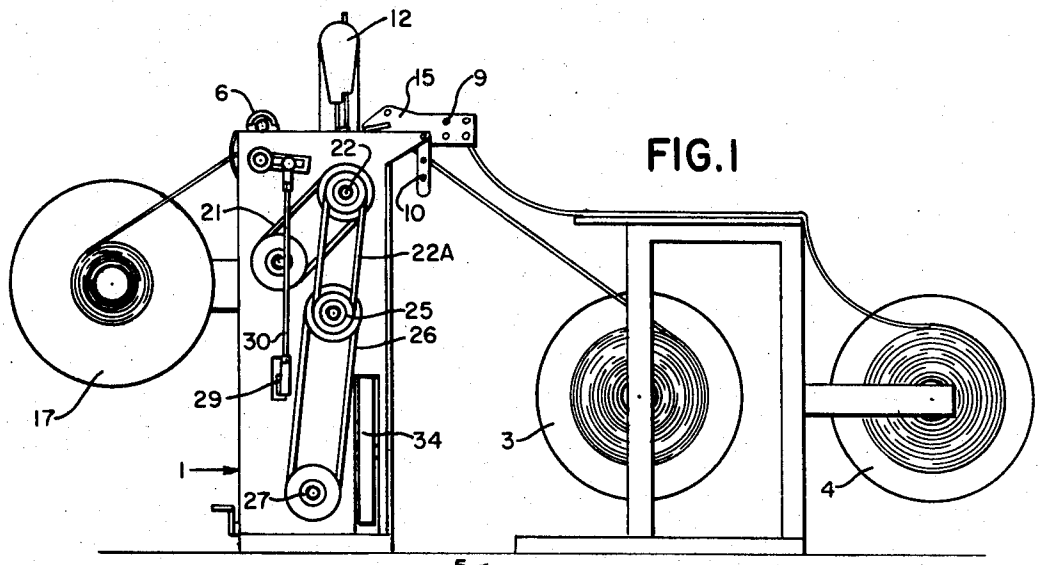


FIG. 1

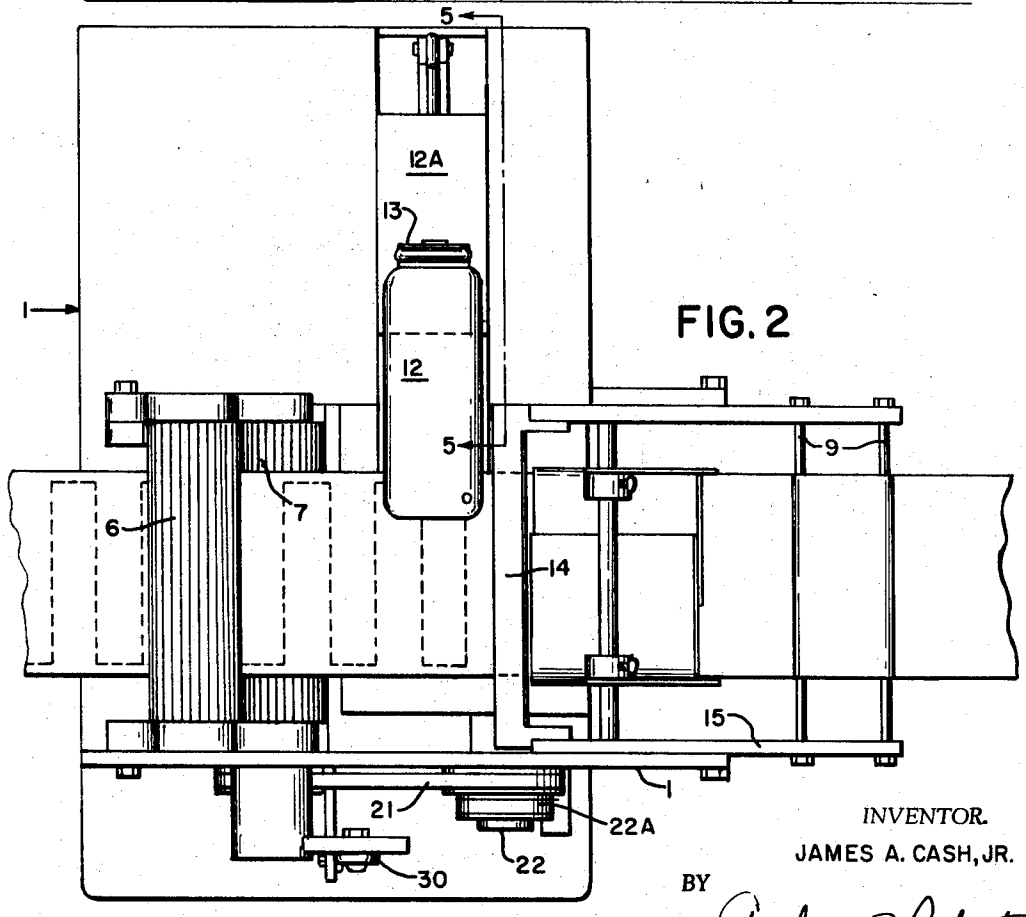


FIG. 2

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FIG. 3

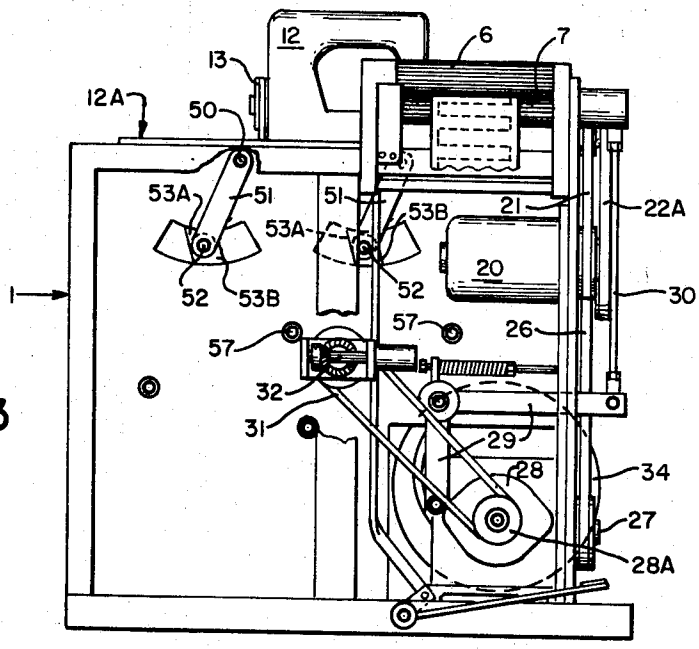
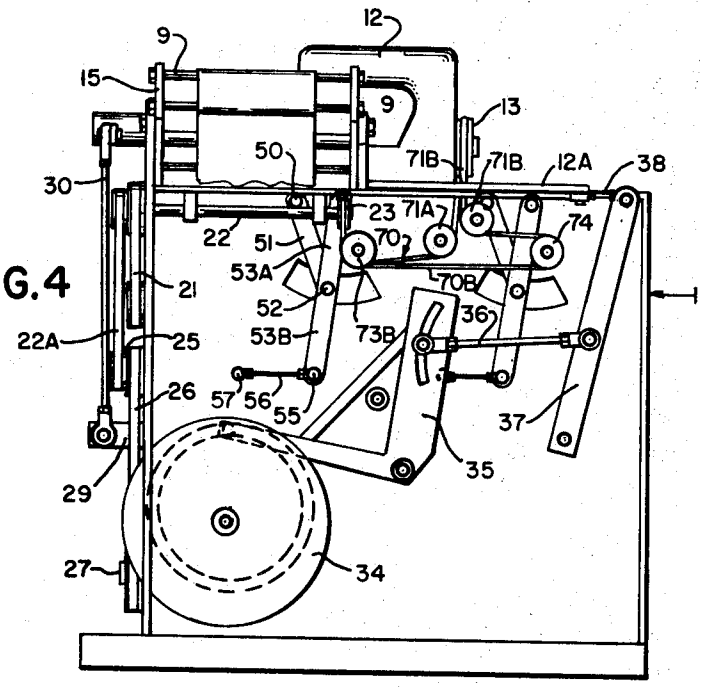



FIG. 4

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BORDER PANEL MANUFACTURING MACHINE

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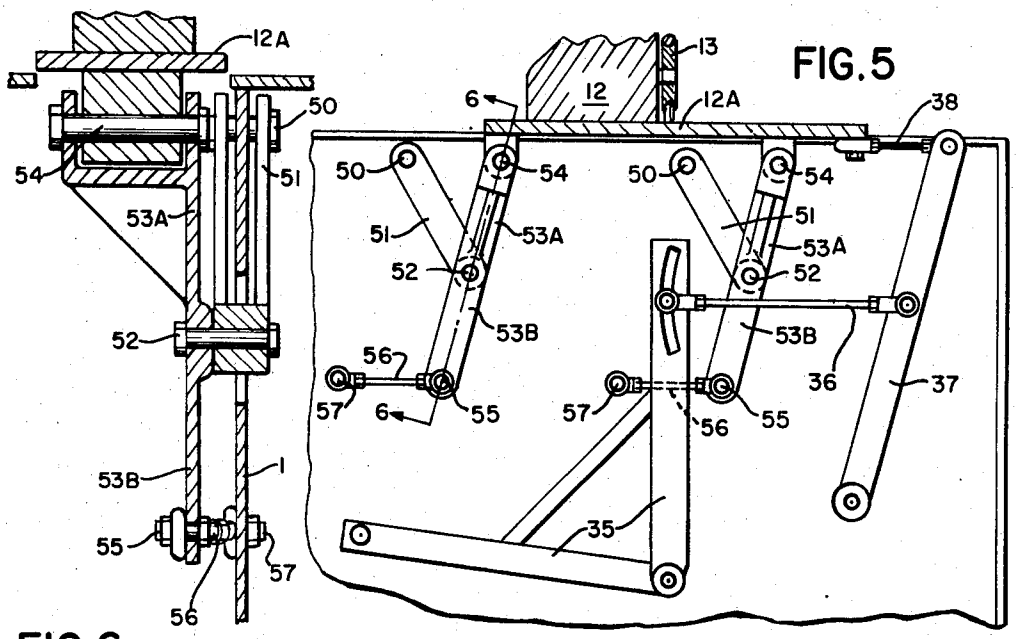
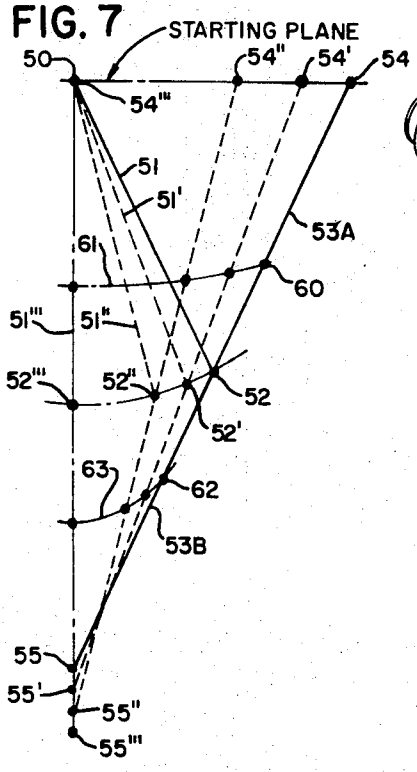



FIG.5

FIG.6

FIG. 7



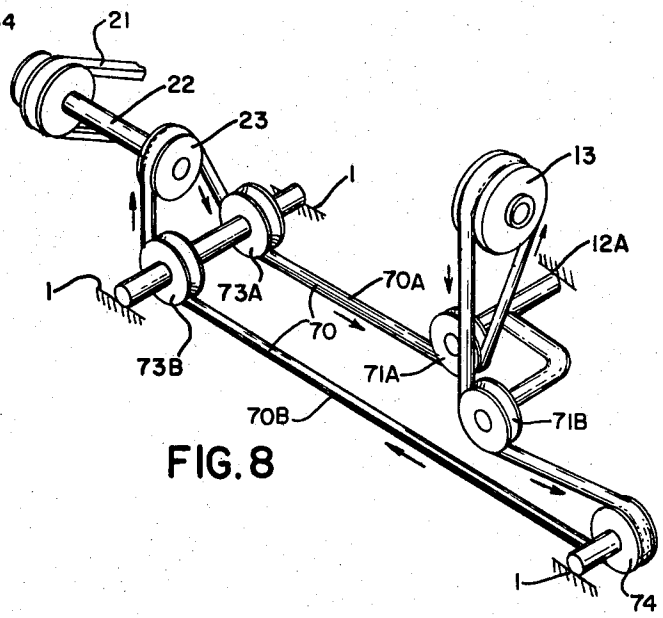




FIG. 8

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3,371,630

Patented Mar. 5, 1968



3,371,630

# BORDER PANEL MANUFACTURING MACHINE

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6 Claims. (Cl. 112—2)

## ABSTRACT OF THE DISCLOSURE

An improved means for supporting a sewing machine head on an apparatus for manufacturing mattress border panels wherein a border panel fabric assembly is moved longitudinally through the manufacturing apparatus while the sewing machine is moved transversely back and forth over the longitudinal path of the border panel fabric assembly. The sewing machine head frame support comprises a pair of horizontally spaced linkage units cooperatively mounting the head frame on the apparatus base frame for back and forth translational movement along a flat substantially planar path.

This invention relates to improvements in border panel manufacturing machines.

Mattresses are conventionally enclosed completely within a case or cover comprising: top and bottom face panels; and a border panel extending completely around the perimeter of the mattress with its top and bottom edges sewn to the top and bottom face panels. A typical border panel is compised of an outer decorative cloth or ticking and an inner or backing layer of felt or wadding, usually with a layer of scrim to support the wadding.

One conventional border panel manufacturing machine, which is shown in U.S. Patent No. 3,160,124, comprises:

(A) a base over which the work moves longitudinally forward in a direction proceeding from the rear end toward the front end of the base;

(B) work supply reels at the rear end of the base;

(C) work feed means at the front end of the base for pulling the work from the rear supply reels forwardly over the base in a manner causing the layers forming the work to be assembled one upon the other at the rear end of the base and to pass through a sewing zone between the rear and front ends thereof;

(D) work tensioning means adjacent the rear end of the base yieldably resisting the pull of the work feed means on the ticking so as to tension the work;

(E) a sewing machine mounted on the base for transverse movement back and forth in the sewing zone along a sewing path extending transversely across the work from one margin to the other, said sewing machine including a needle above the work for vertical reciprocation through the work and a cooperating thread locking means below the work;

(F) work clamping means arranged over the work on the rear side of said sewing path for vertical movement downwardly to clamp the work against the base and upwardly to release the work;

(G) means for receiving the work product from the feed means and winding it into a roll; and

(H) drive means for

(1) continuously reciprocating the needle and operating the thread locking means in timed relationship therewith for work stitching purposes,

(2) intermittently actuating the feeding means to pull the work longitudinally forward at spaced feeding intervals,

(3) intermittently moving the sewing machine back and forth in the sewing zone along said work crossing path between feeding intervals with a dwell period at each end of said sewing path corresponding to the next work feeding interval so that said machine operates to make one right-to-left transverse line of stitching during one non-feed interval, a longitudinal line of stitching along the left margin during the following feed interval, a left-to-right transverse line of stitching during the next non-feed interval and a longitudinal line of stitching along the right margin during the next feed interval and to repeat this pattern during subsequent intervals and thereby sew a continuous "square-cut zigzag" line of stitching,

(4) operating said clamping means to clamp the work during each cross sewing interval, and

(5) operating the winding means as the work product is discharged by the feed means.



The principal object of the present invention is to improve the mounting of the sewing machine for said transverse back-and-forth reciprocating motion to the end of making this operation noiseless.

The needle-operating and stitch-locking mechanisms of the sewing head are operated from a drive pulley on that head. This pulley is connected to base-mounted drive pulleys through an intervening drive connection which must accommodate said transverse back-and-forth reciprocating movement of the head.

As shown in my U.S. Patent 2,771,045, this intervening drive connection comprises: a fixed base-mounted pulley-driven rotary drive shaft; a pulley slidably mounted on that shaft and driven thereby; a belt interconnecting the slidable pulley with the sewing head pulley; and means for reciprocating the sewing head on the base frame and the slidable pulley and the head frame drive pulley properly aligned during the sewing operation.

Another important object of this invention is to simplify and thereby improve this intervening drive connection between the sewing head drive pulley and the base-mounted drive pulleys.

The noiseless mounting of the sewing head is accomplished by bodily supporting it upon a base-mounted linkage means which operates to carry the head translationally back and forth along a path substantially parallel to the sewing line of the work and which, at the same time, holds the sewing head out of slidable contact with the base frame. More particularly, the base-mounted linkage means comprises: a pair of pivotally interconnected links arranged to form an (upwardly) open articulated V-linkage which pivotally interconnects the base and head frames to support the head frame on the base frame for back and forth reciprocating movement and guide means for confining the movement of the head frame connection of the V to a horizontal plane.

Preferably, duplicate linkage means are provided at opposite ends of the sewing machine and these cooperate to constrain the sewing machine to move horizontally back and forth along a straight path in a noiseless and vibration-free manner.

The simplification of the driving connection between the base-mounted drive means and the sewing head drive pulley may be accomplished as follows: (1) providing an

intermediate driving connection in the form of an endless belt; (2) extending both driving and return runs of said belt between fixed base-mounted pulleys which are horizontally spaced a distance greater than the horizontal movement of the sewing head; (3) providing, between these fixed spaced base-mounted pulleys, a pair of movable head-mounted idler pulleys located along the driving run of the belt; and (4) looping the driving run of the belt upwardly between these idler pulleys and around the sewing head drive pulley so that the driving run turns around one idler pulley at the entrance of the loop and around the other idler pulley at the exit of the loop while the idler pulleys move back and forth along the driving run between the fixed base-mounted pulleys as the head frame reciprocates. This arrangement is simple, inexpensive to make and install and operates effectively in a noiseless and vibration-free manner.

A border panel manufacturing machine embodying the invention is illustrated in the accompanying drawings wherein:

FIG. 1 is a side elevation of the machine with the side door open or broken away to show certain drive shafts, drive pulleys and related parts;

FIG. 2 is an enlarged top plan view of the machine shown in FIG. 1;

FIG. 3 is a front elevation with the front door open or broken away to show the drive motor and wind-up reed drive;

FIG. 4 is a rear elevation with the rear doors open, broken away or removed;

FIG. 5 is a rear elevation of the upper end portion of the casing shown in FIG. 4 on a larger scale and with the rear wall completely broken away;

FIG. 6 is a vertical section taken along lines **6—6** of FIG. 5;

FIG. 7 is a schematic view of the sewing head mounting to illustrate how level reciprocating motion is obtained; and

FIG. 8 is a perspective view of the intervening drive connection between the sewing head drive pulley and certain base-mounted drive pulleys.

## CONVENTIONAL STRUCTURE

The structure illustrated in the drawings conventionally inclcudes:

(A) a base **1** composed of a box-like housing and any suitable form of structural frame enclosed therein;

(B) work-supply means mounted on a suitable table preferably spaced rearwardly from the rear end of the base **1**, this supply means including rolls **3** and **4** of strip-like wadding and ticking, respectively, these materials being extended forwardly over the top of the base **1** in superposed relationship;

(C) work-feed means in the form of upper and lower rolls **6** and **7** mounted on the top of the machine adjacent the front end thereof, these rolls functioning to pull the work forwardly through the machine;

(D) work-tensioning means interposed at the rear of the machine between the base **1** and the supply rolls of panel material, the tensioning means being in the form of a suitable zig-zag arrangement of friction bars **9** for the ticking and bars **10** for the scrim when it is to be used under tension;

(E) a sewing machine **12** located on the top of the base between the front and rear ends thereof and adapted for transverse movement back and forth along a straight sewing path, it being understood that the sewing machine **12** has a head frame **12A**, a drive pulley **13**, a sewing needle which is supported above the work for vertical reciprocation therethrough and a co-operating thread-locking means (not shown) supported below the work;

(F) means for clamping the work along and adjacent the rear side of the transverse sewing zone, this means including a clamping bar **14** extending along and adjacent to the rear side of the transverse sewing zone, a forwardly tiltable tensioning frame **15** for pressing the bar **14** downwardly into its clamping position and a vertically-arranged cam-operated walking beam (not shown) mounted on the rear side of the base **1** for tilting the frame **15** during non-feed intervals;

(G) work-product-receiving means in the form of a power driven windup reel **17** rotationally mounted on the base **1** with its rotational axis spaced forwardly from the front end thereof; and

(H) drive means which functions

(1) to drive the needle and thread-locking means of the sewing head **12** continuously, this means including drive motor **20**, motor driven belt **21**, belt driven shaft **22** terminating in a fixed base-mounted pulley **23** which is connected to the sewing head drive pulley **13** through an intermediate driving connection,

(2) to drive the work-feed rollers **6** and **7** and the work-product wind-up reel **17** at intermittent work-feeding intervals spaced by non-feeding intervals, this drive including,

(a) for the rolls **6** and **7**, motor, belt and shaft parts **20–22**, belt **22A**, belt driven speed changer **25**, changer driven belt **26**, drive shaft **27** of a gear reducer (not shown), reducer-driven cam **28**, cam-operated bell crank **29**, and crank-driven arm **30** for the ratchet drive of the feed rolls, and,

(b) for the wind-up reel **17**, parts **20–22**, belt **22A**, parts **25–26**, reducer drive shaft **27**, reducer-driven pulley **28A**, pulley-driven V-belt **31** driving the rear end of a forwardly extending shaft not shown, the front end of which is geared at **32** to wind-up reel **17**, the slippage of V-belt **31** controlling the non-rotating intervals of the reel, and

(3) to actuate the work-clamping means in the work-clamping direction and horizontally move the sewing machine **12** one transverse stroke during each non-feeding interval, this drive including (a) for the work-clamping means, parts **20–22**, belt **22A**, parts **25–26**, reducer drive shaft **27**, reducer-driven cam **34** and a base-mounted pivotal lever (not shown) interconnecting cam **34** with the tilt frame **15**, and (b) for reciprocating the head frame, the same parts from motor **20** through cam **34**, cam-operated bell crank **35** and adjusting link **36** interconnecting crank **35** with head frame reciprocating lever **37**. The head frame reciprocating lever **37** is pivotally mounted at its lower end upon the base with its upper end connected to one end of head frame **12A** through an interposed link **38**, which is best shown in FIG. 4.

## OPERATION

The machine is first loaded by mounting a roll of scrim, if used, a roll of wadding **3** and one of ticking **4** on the table, directing the scrim around the rods **10** and thence over the top of the base through the sewing zone (with the needle in its uppermost position) and between the feed rollers **6–7** with the upper feed roll in its upper inoperative position, similarly directing the wadding **3** except that it bypasses the tensioning rods, and training the ticking **4** first around one or more of the work tensioning rods **9** and thence over the base through the sewing zone and between the work feed rolls. Now the rolls are lowered and the drive motor started. Thereafter the machine will operate automatically in conventional fashion. Of course, the work product should be directed to and wound upon reel **17**.

During a non-feed interval, the border machine operates to clamp the work against the base **1** along the rear side of the sewing zone and to move the continuously stitching sewing machine **12** one stroke so as to sew one

stitch line across the work. This completes the non-feeding interval; hence, the work is unclamped and a feeding interval instituted. During the feeding interval, the feed rolls **6–7** rotate to pull the work forwardly against the drag of the work tensioning means while the sewing machine **12** will sew one longitudinal stitch line along one margin of the moving work and continue to do so as long as the work moves forwardly.

At the end of this feeding interval, the work feed rolls **6–7** stop, the work is once again clamped and the continuously operating sewing machine **12** is now moved through its return stroke during which it again sews one transverse line of stitching. When the sewing machine reaches the end of that return stroke, the non-feed interval terminates and the next feed interval begins during which the parts operate as before to sew the wadding and ticking together along another longitudinal seam. This type of operation continues automatically until the supplies of wadding and ticking are exhausted.

## INVENTIVE STRUCTURE

### *Head frame mounting*

Now, in accordance with my invention, I mount the head frame **12A** upon the base **1** through an interposed linkage means which is pivotally connected to both head and base frames and which is operative to support the head frame bodily on the base frame for back and forth translational movement along a path substantially parallel to the desired sewing line and which substantially holds the head frame out of slidable contact with the base frame during such movement.

In my presently preferred embodiment, this linkage means preferably includes a pair of horizontally-spaced duplicate linkage unit or arrangements, one for each end of the head frame, each presently preferred arangement compises: (A) an upwardly open articulated V-linkage pivotally interconnecting the base and head frames to support the head frame on the base frame for back and forth reciprocating movement; and (B) guide means for confining the movement of the connection between the head frame and the V-linkage to a horizontal plane.

The interconnected V-linkage includes: a fixed base frame pivot **50**; a base link **51** having base and apex ends and depending from fixed pivot **50**; a floating apex pivot **52** at the lower or apex end of the base link **51**; an upright head link **53A** having apex and head ends with its lower or apex end pivotally connected to the lower or apex end of the depending base link **51** through apex pivot **52**; and a fixed head frame pivot **54** pivotally connecting the upper head end of the upright head link **53A** to a fixed pivot point on one end of the head frame **12A**.

In the presently preferred arrangement, the guide means comprises: (A) a link **53B** equal in length to the length of upright head link **53A** and forming an integral downward extension thereof; and (B) means for confining the movement of the lower end of link **53B** to a vertical path, this means specifically including a guide pivot **55** at the lower end of link **53B**, a horizontal guide link **56** having one end pivotally connected to the lower end of link **53B** through guide pivot **55** and a base pivot **57** pivotally mounting the other end of guide link **56** on base frame **1**.

With the foregoing arrangement, each time lever **37** is moved angularly in one direction to push or pull the sewing head frame **12A** through one stroke in the corresponding direction, each head pivot **54** of the V will be constrained to move in a horizontal level plane. This can be best shown by referring to FIG. 7 which shows, in solid lines, the starting position of the following interconnected V and guide means parts, viz: fixed base pivot **50**, base-mounted link **51**, floating apex pivot **52**, upright head link **53A**, and head frame pivot **54**; and link **53B** and its lower end pivot **55**.

During the 1st 15% of the stroke, the head frame pivot **54** will tend to swing arcuately upward about the floating apex pivot **52** and thus tend to rise in elevation. However, during that same movement, the floating apex pivot **52** will swing downwardly about fixed base pivot **50** to the position indicated at **52'** and thereby keep the movement of pivot **54** in its horizontal starting plane as indicated at **54'**. The lowering of pivot **52** will also lower guide pivot **55** along a substantially vertical line to the position indicated at **55'**. Obviously pivot **55** moves arcuately downward about pivot point **57** but the horizontal component of that movement is normally so slight as to be negligible.

This same action will occur during each additional increment of stroke movement. As a consequence, pivots **52**, **54** and **55** will not only reach the positions indicated at **52''**, **54''** and **55''** when 40% of the indicated stroke movement has been completed but also reach the position indicated at **52'''**, **54'''** and **55'''** when the stroke movement has been completed.

The V linkage has been illustrated and explained as an upwardly open V merely for the sake of clarity. Obviously that linkage can be designed to open downwardly, horizontally or otherwise.

By making the levers **51**, **53A** and **53B** all equal in length, the movement of head pivot **54** can be confined to a horizontal plane when the movement of guide pivot **55** is more or less confined to a vertical plane. However, it will be appreciated that the same result can be obtained by guiding some point fixed on links **53A** or **53B** (or fixedly connected thereto) along that predetermined path which is required to confine the movement of pivot **54** to the horizontal starting plane. Thus, in FIG. 7, if fixed point **60** of link **53A** is guided along path **61**, then the movement of pivot **54** will be confined to the horizontal starting plane. The same is true when fixed point **62** on link **53B** is guided along path **63**.

### *Intermediate drive connection for sewing head*

As previously noted, the means for continuously driving the needle and thread-locking means of the sewing head **12** includes: drive motor **20**, motor-driven belt **21** and belt-driven shaft **22** of a fixed drive train which terminates in a fixed base-mounted pulley **23**; and an intermediate driving connection which extend from fixed base-mounted pulley **23** and which connects that fixed pulley with the sewing machine drive pulley **13**. For the sake of clarity, the fixed base-mounted pulley **23** and the head mounted sewing machine drive pulley **13** are hereinafter referred to as the first and last pulleys respectively. Since the last pulley is mounted to drive the sewing machine head while moving horizontally back and forth with it, the intermediate driving connection between the first and last pulleys must be (and heretofore has been) fashioned to accommodate the stroke motion of the head.

In further accordance with my invention, this intermediate driving connection is simplified to comprise: (A) an endless belt **70** for interconnecting the first and last pulleys **23** and **13** to provide drive and return runs **70A** and **70B** therebetween; and (B) a head-mounted belt-directing means located below the last pulley **13** for horizontal reciprocating movement with the head and arranged to maintain that portion of the belt **70**, which engages and extends adjacent to both ends of the last pulley **13**, in the form of a vertically-extending downwardly-open loop which travels with the head **12** through the length of each stroke.

The means providing the belt **70** with the travelling loop comprises a pair of idler pulleys **71A** and **71B** located below the last pulley **13** and mounted on the head frame **12A** for horizontal stroke movement therewith. Furthermore, idler pulley **71A** is positioned at the entrance of the loop to receive the horizontally travelling section of the driving run **70A** coming from the first pulley **23** and to discharge it vertically upward to one side of the last pulley **13** while idler pulley **71B** is positioned at the exit of the loop to receive a vertically travelling section of the

return run **70B** coming down from the other side of the last pulley **13** and to discharge it horizontally.

In order to accommodate the back and forth movement of the loop of the belt **70**, base-mounted pulleys must be mounted on each side of the loop-forming assembly of head-mounted pulleys and spaced from each other a distance greater than the maximum stroke of the reciprocating movement. Accordingly, pulleys **73A** and **74** are mounted on the driving side and return side of the loop-forming assembly of head-mounted pulleys **71A** and **71B** and spaced from each other a distance greater than the maximum stroke of the sewing head **12** which, of course, determines the maximum horizontal reciprocation of the loop.

Since the first pulley **23** is vertically arranged for rotation about a horizontal axis, that portion of the belt **70**, which engages and extends adjacent to both of its sides, is in the form of a vertically extending downwardly open loop, while the connecting portions of the drive and return runs extend horizontal; hence it is necessary to provide appropriate base-mounted belt-directing means. Accordingly, a fixed belt-directing means is (1) located below the first pulley **23**, (2) mounted on the base and (3) arranged (*a*) through one belt-turning member (in the form of said idler pulley **73A**) to receive the vertically travelling section of the drive run **70A** coming down from one side of the first pulley **23** and to discharge it horizontally toward the head-mounted idler pulley **71A** and (*b*) through another belt turning member (in the form of an idler pulley **73B**) to receive the horizontally returning section of the return run **70B** and to discharge it upwardly to the other side of the first pulley **23**.

A belt driving arrangement equivalent to the one provided by pulleys **23**, **73A** and **73B**, may be formed simply by mounting pulley **23** for rotation about a vertical axis so that belt runs **70A** and **70B** extend horizontally from pulley **23**.

Having described my invention, I claim:

**1.** In an apparatus for manufacturing mattress border panels wherein a border panel fabric assembly is moved longitudinally through the apparatus while a sewing machine is intermittently moved over the longitudinal path of the border panel assembly first in one transverse direction along a fixed sewing line, and then in the opposite transverse direction along said fixed sewing line, an improved means for supporting the sewing machine head frame on the apparatus base frame for such intermittent back-and-forth movement and for guiding said head frame in such movement, comprising:

(A) a pair of horizontally-spaced mounting units for cooperatively mounting a head frame on a base frame for back and forth translational movement along a flat substantially planar path, which is substantially parallel to said fixed sewing line,

(1) one of said mounting units including

(a) a V linkage composed of a base link having base and apex ends, a head link having apex and head ends, and means pivotally connecting their apex ends together,

(b) means pivotally mounting the base link at its base end on said base frame for back and forth pivotal movement toward and away from said flat path,

(c) means mounting the head frame on the V linkage, including means pivoting the head end of the head link to the head frame at a fixed pivot point thereon for translational movement therewith, and

(d) base-frame mounted guide means connected to guide the fixed pivot point at the head end of the head link along a fixed path, corresponding to said flat path, during said back and forth translational movement, said guide means operating to turn the head link angularly about its apex end pivot in back and forth directions opposite to those which the base link makes contemporaneously about its base end pivot.

**2.** The improvement of claim **1** wherein:

(A) said base and head links depend from their respective base end and head end pivots; and

(B) said guide means include:

(1) an integral downward extension of said head link, and

(2) a connection to the lower end of said downward extension for said guiding purposes.

**3.** The improvement of claim **2** wherein:

(A) said one mounting unit provides a mounting for one end portion of said head frame; and

(B) said mounting means includes a substantially identical mounting unit for the opposite end portion of said head frame.

**4.** The improvement of claim **2** wherein:

(A) the pivot-to-pivot length of said base link and head link are substantially equal; and

(B) said base-mounted guide means includes a base-mounted horizontal guide link pivotally connected to said downward extension at a point spaced from said floating pivot a distance substantially equal to the pivot-to-pivot length of said head link.

**5.** In an apparatus for manufacturing mattress border panels wherein a border panel assembly is moved longitudinally through the apparatus while a sewing machine is intermittently reciprocated through back and forth strokes extending across the longitudinal path of that assembly, an improved intermediate drive means for operatively connecting a first motorized drive pulley mounted on the base of the apparatus with a last drive pulley mounted on the sewing head to drive the head while moving back and forth with it, comprising:

(A) an endless belt for interconnecting the first and last pulleys to provide drive and return runs therebetween; and

(B) belt directing means mounted on the sewing head for horizontal reciprocating movement therewith and arranged below the last pulley to maintain that portion of the belt, which is on and adjacent to the last pulley, in the form of a vertically-extending downwardly-open loop which travels back and forth with the head throughout the length of each stroke,

(1) said belt directing means including

(a) one belt-turning member mounted on the head to receive a horizontally-approaching section of the drive run coming from the first pulley and to discharge it upwardly to one side of the last pulley so as to form therebetween one side of said downwardly-open loop, and

(b) another belt-turning head-mounted member spaced from one member and arranged to receive a vertically approaching section of the return run of the belt coming from the other side of the last pulley to form therebetween the other side of said downwardly-open loop and to discharge it horizontally.

**6.** The intermediate drive means of claim **5** including:

(A) a pair of first and second belt-turning base-mounted members

(1) spaced from each other a distance greater than the maximum stroke of said sewing head, and

(2) spaced from opposite sides of said assembly of head-mounted members,

(a) said first belt-turning base-mounted member being arranged to direct the drive run horizontally toward said one head-mounted member, and

(b) said second belt-turning base-mounted member being arranged to receive a hori-

zontally traveling section of the return run from said other head-mounted member.


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