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PATTERN CONTROLLED DRIVING MECHANISM FOR QUILTING MACHINE

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3 Sheets-Sheet 1

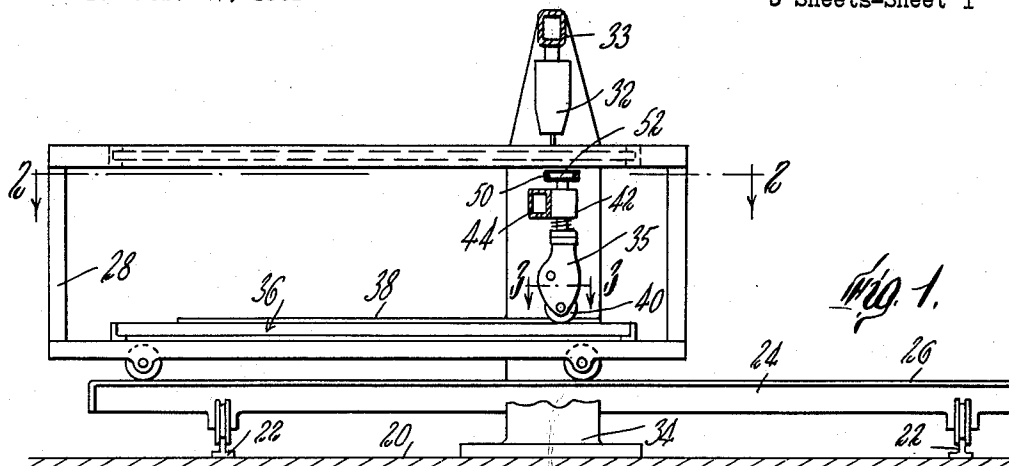


Fig. 1.

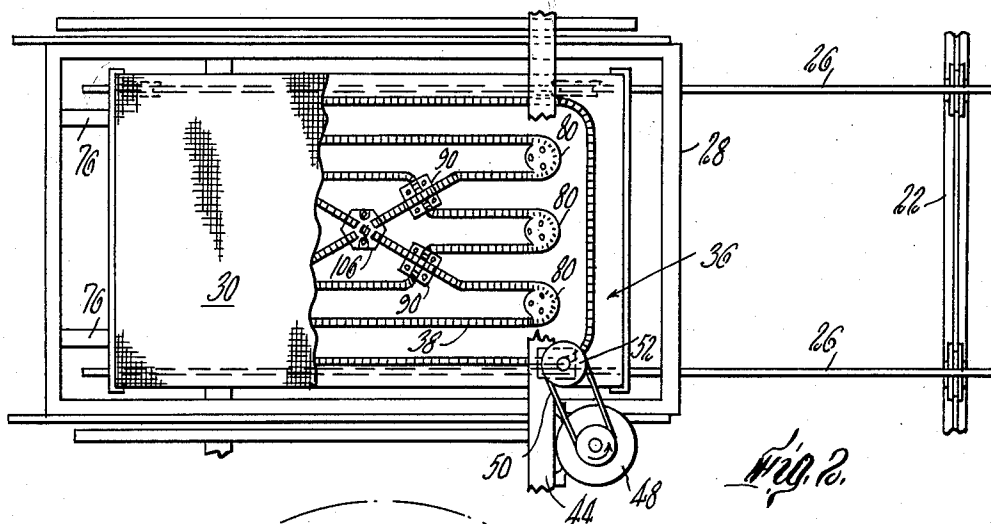


Fig. 2.

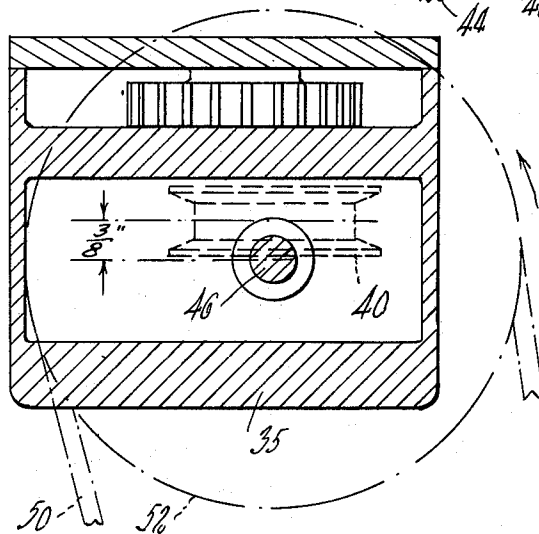


Fig. 3.

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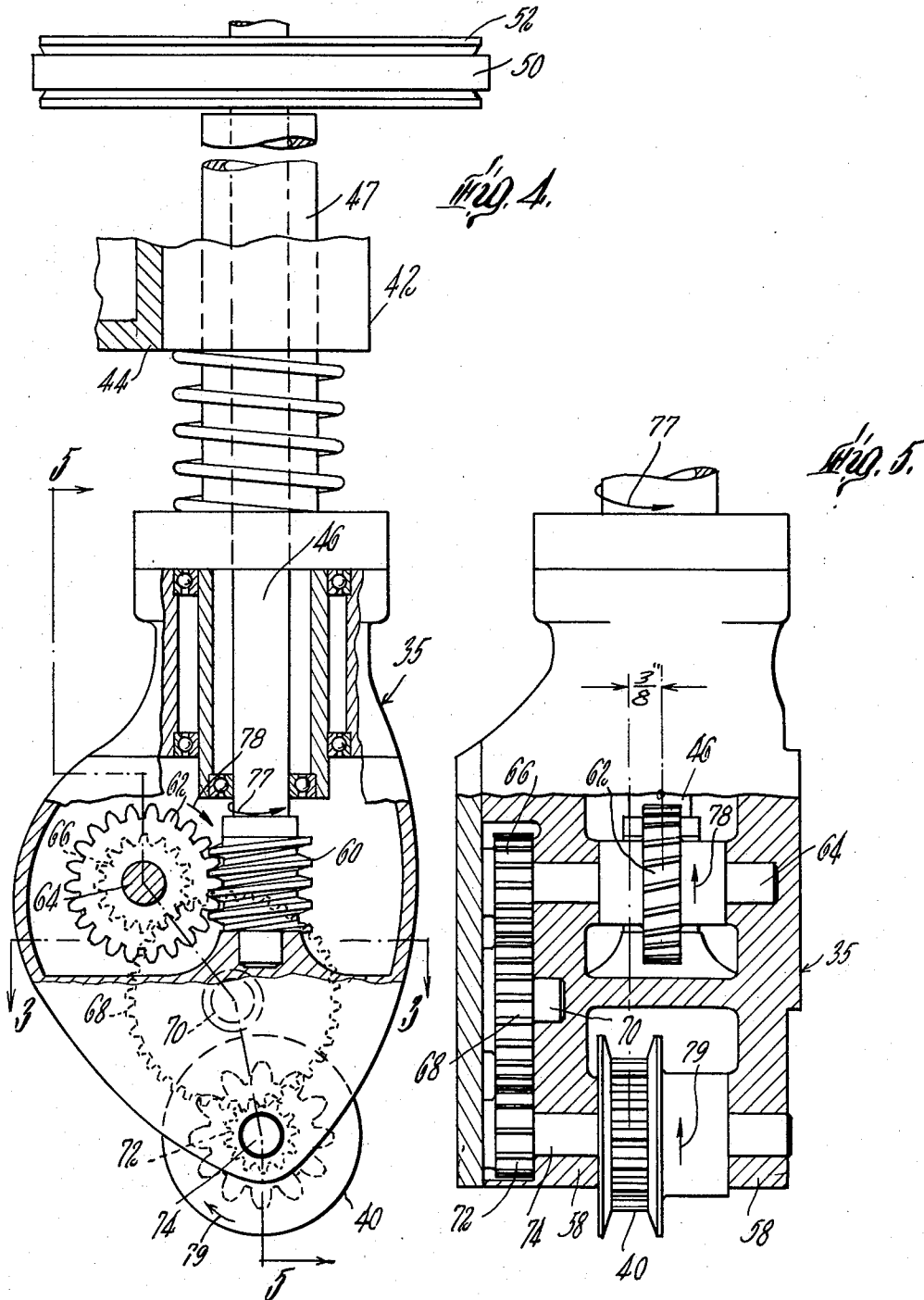
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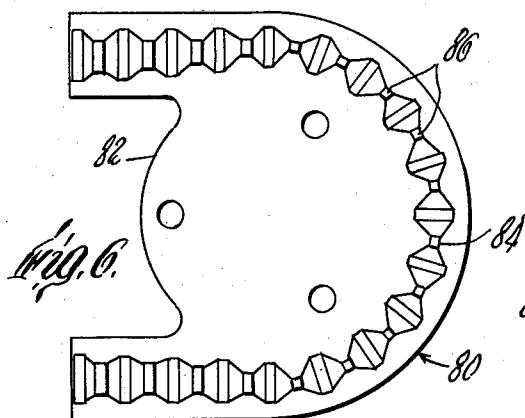
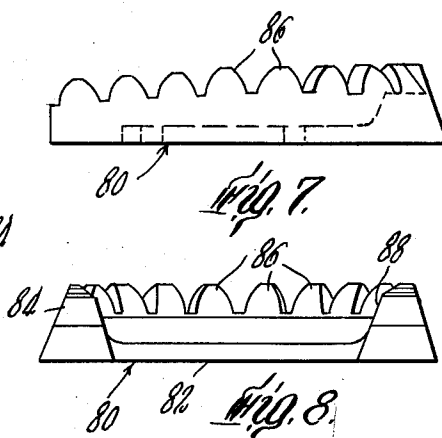
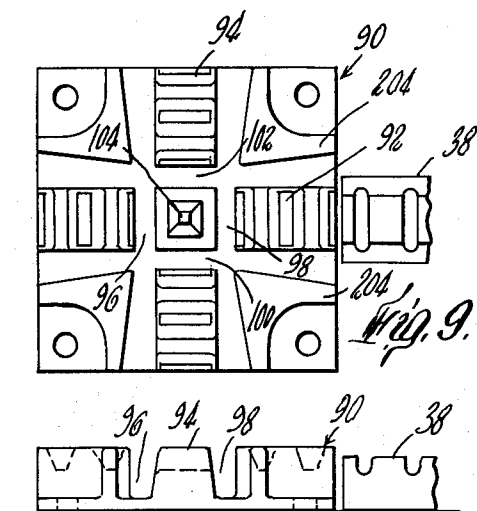
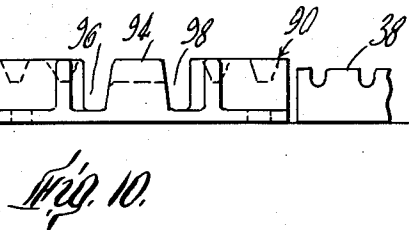
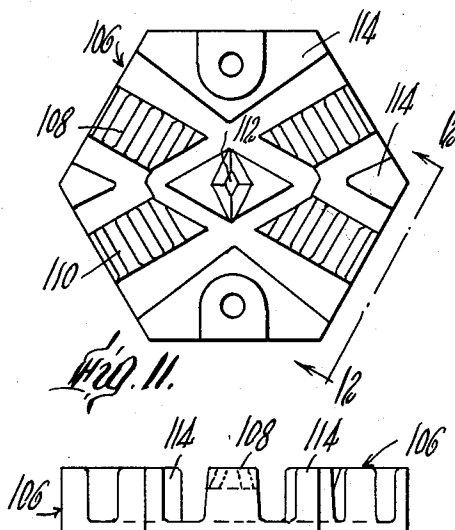
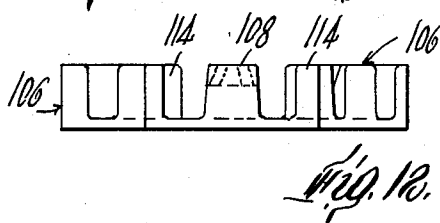
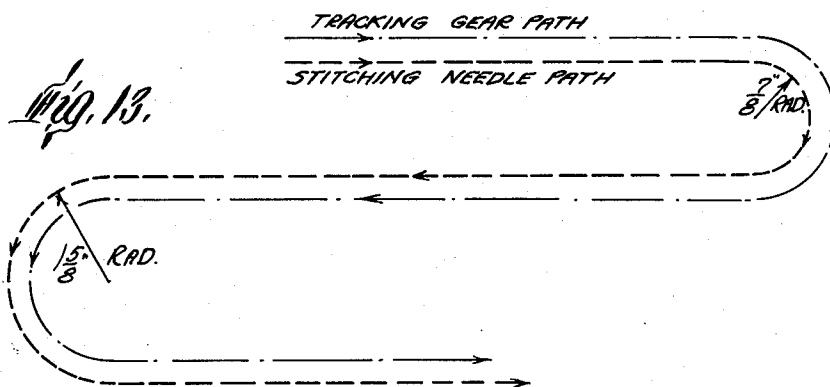
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3,125,047

PATTERN CONTROLLED DRIVING MECHANISM FOR QUILTING MACHINE

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3 Claims. (Cl. 112—118)

The present invention relates to improvements in quilting machines, and in particular to an improved pattern controlled driving mechanism for imparting relative feed movements to the sewing mechanism and to the quilt panel supporting table assembly including a templet and a power driven tracking head engaging therewith.

It is a principal object of the invention to improve the qualities of the tracking drive assembly to provide a maximum thrust of the tracking gear upon the track in the direction or directions dictated by the turnings of the track pattern, to eliminate any tendency of the tracking head to turn or twist off of its track, to improve the cornering ability of the tracking head, and to make possible the turning of tighter corners and thereby to provide for a substantially greater flexibility of design.

It is a further object of the invention to improve the construction of the tracking belt including the provision of an improved cornering device adapted for the making of sharp turns, and an improved construction of the crossovers employed to insure an adequate control of the tracking gear on the track at the crossover.

The invention is herein disclosed as embodied in a quilting machine of the general type having with a base, a table assembly which comprises a movable frame and a table slidably supported on the frame for movement in diverse directions, a sewing head mounted in a relatively fixed position on the base above the table, and a pattern controlled device for moving the table with relation to the sewing head for stitching a quilt in accordance with a predetermined pattern.

The pattern controlled movements referred to are imparted to the table by means of a pattern controlled table driving assembly which comprises a templet in the form of a platform mounted to move with the table and a cog tracking belt laid out in a pattern on said platform, and a tracking head assembly mounted on the base comprising a drive shaft rotatable on a vertical axis, a tracking head arranged to swivel on the same axis, and a tracking gear carried by said tracking head which meshes with cogs of said driving belt, and is further provided with direction control flanges engaging said belt to angularly position said wheel and housing in conformity with the tracking direction of said belt.

In accordance with the invention the tracking head carries a tracking gear which is connected to be driven from the drive shaft through gearing carried by the tracking head, and which is offset by a small amount from the axis of the tracking head swivel. The amount of the offset is adjusted so that the product of said offset and the work thrust of said tracking wheel substantially offsets the rotational torque transmitted by said drive shaft to said driving head.

A feature of the invention consists in the provision of an improved tracking belt assembly which includes the use of preformed inserts adapted for more adequately guiding the tracking gear at particular points in the pattern as, for example, for the turning of tight corners and for crossovers at points of intersection of the tracking belt.

For guiding the tracking head around tight turns, which may, for example, extend through 180°, a tracking belt insert is provided which takes the place of a portion of the tracking belt which would normally be turned on itself

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to produce a change in direction of drive of the tracking head. The cogs formed in the top surface of the insert are modified in such a manner as to mesh as perfectly as possible with the teeth of the tracking gear, and the inner edges of the cogs are bevelled to provide clearance for the inside flange of the tracking wheel.

For crossovers a novel crossover insert is provided which is inserted at the crossover point of the tracking belt. A cog is provided at the exact center of the crossover having each pair of opposite faces shaped to provide a continuation of the cog track in each direction across the intersection. Spaces are left at each side of the central cog to permit passage of the flanges of the tracking gear. There is also provided at each diagonal corner of the insert a raised guard surface which together with the cogs provides a U shaped tracking groove for each flange to prevent inadvertent derailing of the tracking gear at the crossover.

With the above noted and other objects in view as may hereinafter appear the several features of the invention consist also in the devices, combinations and arrangement of parts hereinafter described and claimed, which together with the advantages to be obtained hereby will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a somewhat diagrammatic view of a quilting machine illustrating in the preferred form the several features of the invention, portions of the machine having been broken away to illustrate particularly the relationship of the sewing head, the tracking assembly, and templet;

FIG. 2 is a plan view taken on a line 2—2 of FIG. 1, portions of the table and a quilting panel mounted thereon having been broken away to show particularly portions of the templet pattern;

FIG. 3 is a detail sectional plan view taken on a line 3—3 of FIGS. 1 and 4;

FIG. 4 is a detail side view partly in section illustrating particularly the tracking head;

FIG. 5 is a sectional view taken on a line 5—5 of FIG. 4;

FIG. 6 is a detail plan view on an enlarged scale of a preformed insert for use with the tracking belt;

FIG. 7 is a front view of the tracking belt insert shown in FIG. 6;

FIG. 8 is a side view looking from the left of the tracking belt insert shown in FIG. 6;

FIG. 9 is a plan view of a tracking belt insert in the form of a right angle crossover;

FIG. 10 is a view in front elevation in the form of a right angle crossover shown in FIG. 9;

FIG. 11 is a plan view of a diagonal crossover insert for use with the tracking belt;

FIG. 12 is a view in front elevation of the diagonal crossover shown in FIG. 11; and

FIG. 13 is a fragmentary plan view showing the use of two 180° turn inserts utilized to obtain tight turns in the construction of a templet pattern.

Referring specifically to the drawings the quilting machine shown comprises a base 20 with ways 22 on which is mounted a transversely movable frame 24. Cross ways 26 on the frame 24 provide support for a table 28 adapted to receive a quilting frame and quilt 30 to be sewn. The machine is also provided with a sewing head 32 which may be of ordinary description mounted on a stationary overarm 33 carried at each end on a bracket 34 forming part of the machine frame.

The table 28 and quilt 30 mounted thereon are caused to move in diverse directions with relation to the sewing head to cause the quilt to be sewn in accordance with a pattern by means of a power driven tracking device in-

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cluding a tracking head 35 rotatably supported on the machine in fixed relation to the sewing head 32, and a templet 36 comprising a tracking belt 38 which is engaged by a tracking gear 40 carried by the tracking head. As best shown in FIGS. 1 and 4 the tracking head assembly comprises a housing 42 secured to a cross bar 44 which extends across the machine beneath the table, and a vertically arranged drive shaft 46 mounted in suitable bearings within a vertical tube 47 fixed to said housing 42. The drive shaft 46 is driven from an electric motor 48 carried on the cross bar 44 by means of a belt 50 passing around a pulley on the armature shaft of the motor and a pulley 52 secured to the upper end of drive shaft 46.

The housing 42 provides support also for the depending tracking head 35 which is swivelled on the same vertical axis with the drive shaft 46. The tracking gear 40 is mounted to turn on transverse bearings 58 formed in the lower end of the tracking head 35, and is driven from the vertical drive shaft 46 through gearing carried within the tracking head. In accordance with the present invention the tracking gear 40 is offset by a small amount from the swivel axis of the tracking head housing 42. A worm 60 on the lower end of the drive shaft 46 meshes with a worm gear 62 on a cross shaft 64. A second gear 66 on the shaft 64 meshes with an idler gear 68 on a parallel stub shaft 70, which gear in turn meshes with a gear 72 mounted on the cross shaft 74 which carries the tracking gear 40.

As best shown in FIGS. 1 and 2, the tracking assembly including the tracking gear 40 is located substantially beneath the sewing head 32.

With the arrangement shown, the templet 36 is mounted directly beneath the supported quilting panel 30 on a depending portion of the table structure provided by two longitudinally extending rails 76. The templet may, for example, take the form of a plywood board on which is mounted the tracking belt 38 laid out in accordance with the desired pattern.

In the illustrated machine the table 28 is moved in any desired direction with relation to the sewing head in accordance with the pattern by the engagement of the continuously driven tracking gear 40 with the tracking belt 38, the tracking head 35, and tracking gear 40 being rotated in accordance with the dictation of the tracking belt to determine the direction of movement of the table at any given instant.

In the operation of the tracking head it has been found that the load imposed on the tracking gear through the driving connections, which include the vertical drive shaft 46 and gearing carried by the tracking head, create a rotational bias on the tracking head so that it tends to rotate in a corresponding direction which is determined by the direction of drive of the drive shaft 46. As shown, for example, in FIG. 4, the rotational movement of the drive shaft 46 and worm 60 exerts force to rotate the gear 62. It will be recognized that a component of said force is exerted also in a direction longitudinally of the rotational axis of the gear 62 and supporting shaft 64, and that this component is increased by any friction which may exist between the rotating worm 60 and gear 62. This longitudinally directed component of the driving force is transmitted in the form of a rotational torque from the rotating drive shaft 46 to the tracking head 35 on which the gear 62 and shaft 46 are mounted, so that the tracking wheel tends to turn in one direction. This tendency of the tracking gear to turn substantially interferes with the directional control of the tracking gear by the tracking belt, causes the tracking gear to bear hard against one side of the tracking belt with resulting wear and loss of efficiency, and greatly increases the risk that the tracking gear will jump the track.

In the present construction this tendency of the tracking gear to turn has been overcome by offsetting the tracking gear with relation to the swivel axis of the tracking

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head housing 42 by a small amount which in the embodiment of the invention shown is $\frac{3}{8}$ ". Referring to FIGS. 4 and 5, it is assumed that the direction of drive of the vertical shaft 46 is counterclockwise as indicated by arrow 77. The worm 60 is shown as having a right hand thread. The direction of rotation of gear 62 meshing therewith will be in a clockwise direction as shown by the arrow 78 in FIG. 4, and the direction of rotation of the tracking gear 40 will similarly be in a clockwise direction as indicated by the arrow 79. The operation of the mechanism is briefly as follows: The drive shaft 46, rotating counterclockwise as indicated by the arrow 77 in FIGS. 4 and 5, causes a torque to be exerted upon the tracking head 35 in the same counterclockwise direction. The rotation of the tracking gear 40 causes the templet 36 and quilt 30 to be moved in accordance with a pattern thus loading and producing a back thrust upon the gear 40 bodily in a reverse direction. In order to offset the torque imposed on the tracking head in the direction of the arrow 77, the tracking gear 40, rotating in the direction of the arrow 79, is offset to the left, of the axis of the vertical shaft 46 by a calculated amount, for example $\frac{3}{8}$ ", as shown in FIG. 5. The amount of such an offset will be adjustably determined so that the product of the offset and the work producing thrust of the tracking gear will substantially offset the rotational torque transmitted by said drive shaft to said driving head.

To further improve the tracking quality of the tracking head and tracking belt assembly, preformed inserts are employed in combination with the tracking belt in the construction of the templet pattern. The 180° turn insert 80 shown in FIGS. 6 to 8 and FIG. 13 of the drawings is adapted to improve the tracking quality of the tracking assembly particularly during the turning of tight corners. The insert 80 comprises a plaque on which is mounted a section of cog track 84 shaped to make a 180° turn, having cogs 86 which are stepped progressively from a relatively low level at the two ends of the turn to a relatively high level at the middle portion of the turn. The cogs 86 are evenly spaced about the turn to mesh accurately with the teeth of the tracking gear 40. And the inside face of the cog track section 84 is bevelled on a radius 88 about the axis of the turn in order to provide clearance for the inside flange of the tracking gear on the turn.

The improved spacing of the cogs 86 in combination with the stepped rise of the cogs on the turn, and the bevelled inside face of the cog track provide a maximum of lateral support to the flanged tracking gear 40 to prevent the tracking gear from twisting or turning off the track on the turn.

FIGS. 9 and 10 illustrate a preformed right angle crossover insert 90 for use with the tracking belt in the construction of a templet pattern. The insert 90 comprises a plaque on which are mounted two straight cog track sections 92 and 94 intersecting with one another at right angles. The cog track section 92 has formed therein two cutouts 96, 98 to receive the flanges of the tracking gear 40 when traveling on the intersecting track 94. The cog track 94 is similarly formed with two cutouts 100, 102 to receive the flanges of the tracking gear 40 when traveling on the intersecting track 92. At the middle of the intersection there is provided a single cog 104 having the opposite sides thereof shaped to form a continuation of the cog track across the intersection in each of the two intersecting directions of travel. The crossover insert 90 is also provided at each corner with a raised guard portion 204 shaped to provide the outside wall of a groove in which the near flange of the tracking gear rides, thus further insuring that the tracking gear will maintain its position in engagement with the tracking belt.

FIGS. 11 and 12 illustrate a crossover insert 106 in which the two portions of the track cross one another at an acute angle. As in the case of the right angle crossover above described in connection with FIGS. 9 and 10

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intersecting portions 108, 110 of cog track are provided which are respectively cross grooved to receive the flanges of the tracking gear and with a centrally located cog 112 having the opposite faces thereof shaped to form continuations of the intersecting cog tracks. At each corner of the insert 106 there is provided a raised guard portion 114 which is shaped to provide the outside walls of grooves in which the flanges of the tracking gear are accurately guided across the insert.

The invention having been described what is claimed is:

1. A pattern controlled driving mechanism for imparting relative feed movements in a horizontal plane to the sewing mechanism and to the quilt panel supporting table assembly of a quilting machine including a templet and a power driven tracking head engaged therewith, which comprises a templet mounted in a fixed relation to one of said sewing mechanism and said quilt panel supporting table assembly, said templet having mounted thereon a cog tracking belt laid out in accordance with the desired pattern, a tracking assembly comprising a tracking head supported to turn on a vertical axis fixed with relation to the other of said sewing mechanism and quilt panel supporting table assembly, a power input drive member supported for rotation on said vertical axis to supply power to said tracking head, and a tracking gear mounted on said tracking head to turn on a horizontal axis, having teeth for engagement with said cogs, and at each side thereof flanges to guide the tracking gear on said tracking belt in directions conforming to the tracking directions of said tracking belt, and connections carried by the tracking gear for transmitting a rotational driving torque to said tracking gear and an incidental rotational torque to said tracking head, said tracking gear being offset along said horizontal axis from said vertical rotational axis in a direction which will oppose the rotational bias of the back thrust of said tracking gear upon the tracking head to the bias of said incidental rotational torque, said offset being chosen so that the product of said offset and said back thrust substantially equals said incidental rotational torque to permit the free turning of said tracking gear in directions conforming to the tracking direction of said tracking belt.

2. A pattern controlled driving mechanism for imparting relative feed movements to the sewing mechanism and to the quilt panel supporting table assembly of a quilting

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machine having a table assembly comprising a base, a frame, and a quilt supporting table mounted one on the other for movement in diverse directions, and a sewing mechanism supported in fixed relation to the base for sewing a quilt mounted on said table, the combination of a templet including a tracking belt fixed with relation to the table for movement therewith, a tracking assembly mounted on the base comprising a drive member rotatable on a vertical axis, and a tracking head arranged to turn about said vertical axis, a tracking gear having direction controlling edge flanges mounted to turn on a horizontal axis on said tracking head and having a driving engagement with said tracking belt in directions controlled by the tracking direction taken by said tracking belt, said tracking gear being offset along said horizontal axis from said vertical rotational axis in a direction which will oppose the rotational bias of the back thrust of said tracking gear upon the tracking head to the bias of said incidental rotational torque, said offset being chosen so that the product of said offset and said back thrust substantially equals said incidental rotational torque to permit the free turning of said tracking gear in directions conforming with the tracking direction of said tracking belt.

3. For use in a pattern controlled drive mechanism according to claim 2, the combination of a templet having a cog track laid out in accordance with a pattern, a preformed insert for effecting a tight turn of said cog track which comprises a plaque, a cog track segment arcuately disposed on said plaque, said cog track segment having formed thereon an arcuately disposed series of cogs equally spaced from one another to mesh with said tracking gear, successive cogs of said series being located in an arcuately disposed ascending series from a low to a high level followed by a descending series to the original level at the opposite end of said arc, and the inner face of said arcuate cog track being bevelled outwardly to provide clearance for said flanged driving tracking gear on said turn.

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