

Jan. 15, 1963

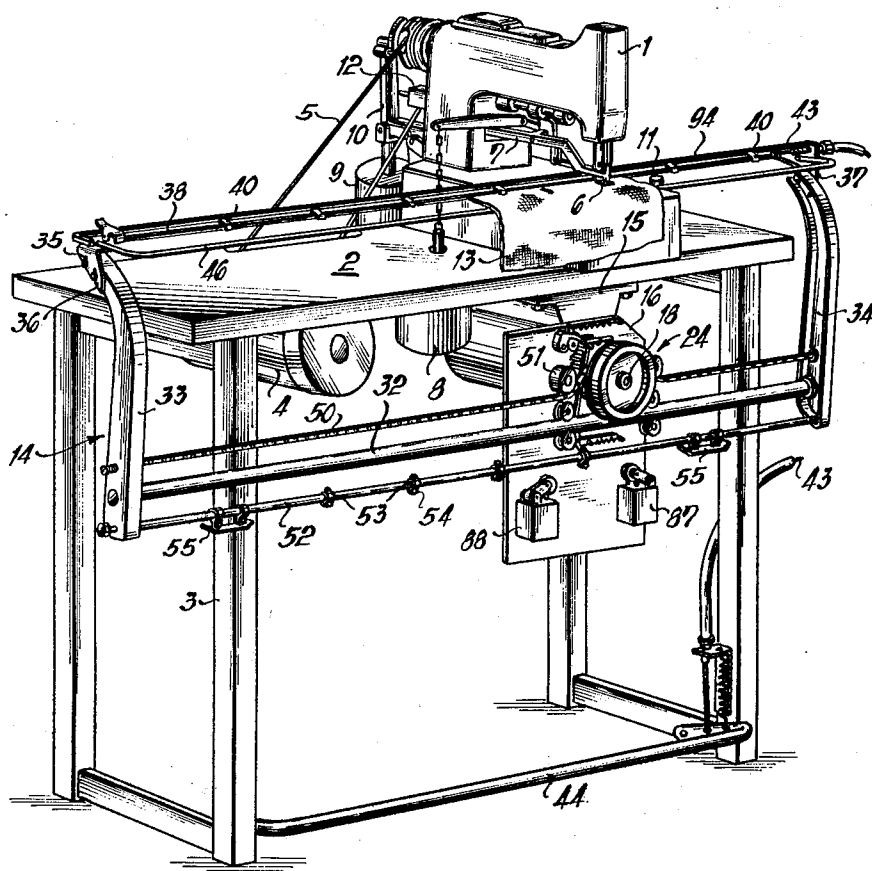
R. REEBER ET AL
ARRANGEMENT FOR GROUP STITCH SEWING MACHINES FOR
FEEDING MATERIAL TO BE STITCHED IN SECTIONS

3,073,267

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3 Sheets-Sheet 1

FIG. 1



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FIG. 2

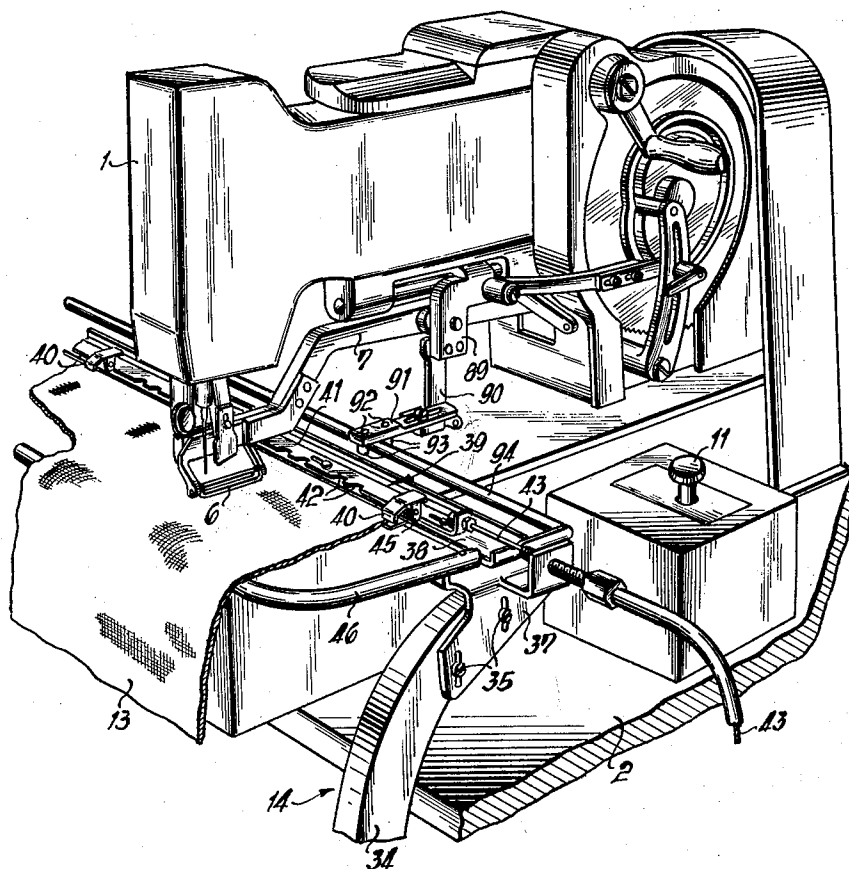
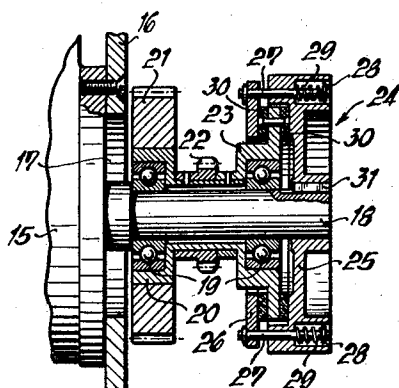


FIG. 5



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FIG. 3

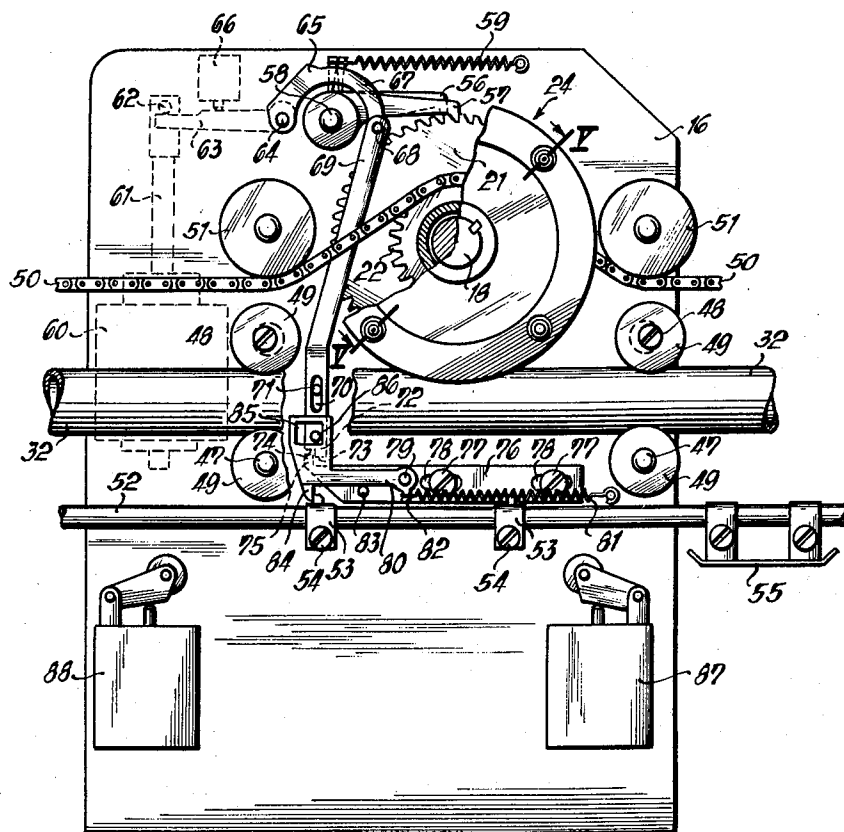
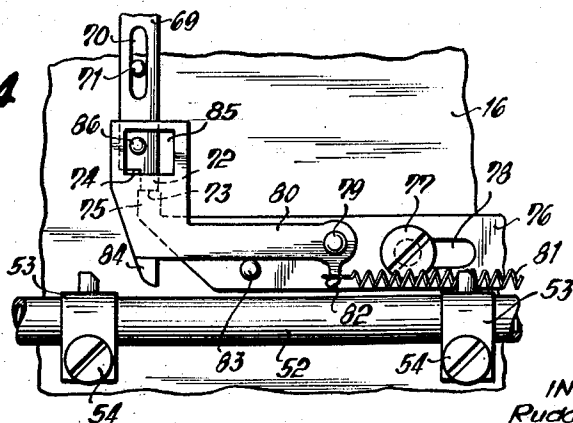


FIG. 4



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ARRANGEMENT FOR GROUP STITCH SEWING MACHINES FOR FEEDING MATERIAL TO BE STITCHED IN SECTIONS

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6 Claims. (Cl. 112-2)

The invention relates to an arrangement in group stitch sewing machines for the control in sections of the feeding between the individual operations on a piece of material and for guiding the material during the operations which are automatically controlled by the machine.

Known arrangements of this type utilize cross slides for feeding the material which are movable longitudinally and transversely in guiding slides or on rollers. Another arrangement provides a material spanning or tightening device which can be moved only longitudinally while the sewing machine is moved perpendicularly thereto.

All arrangements of this type are complicated in construction and require considerable expense for operation and for the precise guiding of the parts which are moved perpendicularly relative to one another in order to keep the necessary bearing tolerances to a minimum. In this connection, moreover, the masses which are moved are so great that the slide can only be advanced at low velocities so that the driving forces must be relatively great.

It is an object of the invention to provide an arrangement which is distinguished by simple and weight economizing construction in a manner that it can be made at relatively low cost, while it can be easily assembled and is readily accessible. The arrangement, furthermore, should be rapidly adjustable to work areas which are disposed at optimum distances from one another.

It is a further object of the invention to provide a feeding arrangement which is reliable and can be readily started and stopped.

The problem is solved in accordance with the invention in a particularly simple manner in that a rack is provided which is vertically disposed, the lower horizontal bar of which is in the form of a runner or rail for the longitudinal movement and serves as a pivot axis for the movements directed perpendicularly thereto, and the upper horizontal bar of which carries the tightening device for the material.

The rack in accordance with the invention provides the special advantage of simplified construction as compared to a cross over or transverse slide and, in spite of this lighter construction, sufficient rigidity of the rack so that the forces of mass which arise during operation remain relatively low.

In a preferred embodiment of the invention the runner or rail for the rack is in the form of a tube which is encompassed by a plurality of rollers. This provides for economical and readily adjustable guidance for the longitudinal and pivot movements of the frame.

The drive for the longitudinal movements of the rack can be effected with a motor by way of a coupling connected with a chain wheel onto a chain which, being secured on both sides to the rack or frame, extends parallel to the runner and at a short distance therefrom. The inherent resiliency of a chain is sufficient to compensate for the deviations to which it is subjected when the rack is pivotally moved. As a result a complicated toothed rod arrangement is eliminated such as was required heretofore.

In accordance with a further object of the invention a simple and reliably operating shifting device for the longitudinal movements of the frame is provided in that

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the driving portion which is in the form of a sliding or friction coupling has secured thereto, together with the chain wheel, a ratchet wheel and two pawls which are displaced relative to one another by one half tooth length of the ratchet wheel in the path of movement of a pivotable bolt, which pivotally connects a pulling lever with a shifting bar which is operated by a magnet which is under the control of the sewing machine, and which bar at its other end is supported in two different positions on a locking slide which may be moved by the shifting cams.

Further objects of the invention and details of the advantages obtained thereby will become apparent from the following description with reference to the accompanying drawings which illustrate an embodiment of the invention and in which:

FIG. 1 is a perspective view of the apparatus provided on a button hole sewing machine,

FIG. 2 is a perspective view of the material tensioning device and of the connecting parts with the presser bar of the machine,

FIG. 3 is a front view of the switching arrangement for controlling the longitudinal movements of the frame and of the frame bearing, partly in section,

FIG. 4 is the disconnecting mechanism shown on an enlarged scale, and

FIG. 5 is a section through the coupling of the driving frame taken along line V—V in FIG. 3.

The button hole sewing machine 1 (FIG. 1) is secured to the work plate 2 of the rack or frame 3 and is driven by way of the belt 5 by the sewing motor 4 which is mounted at the lower side of the work plate 2. The raising of the material feeding frame 6 is effected by material presser magnet 8 by way of the material presser lever 7, while the sewing operation is initiated by the starting magnet 9 by way of the on and off lever 10 which responds to the operation of the manual switch 11. A safety contact 12 is operative during sewing operations to interrupt the material presser magnet 8 so that the material feed frame 6 cannot be raised.

The arrangement for accommodating and automatically guiding the work material 13 on the sewing machine 1 comprises essentially a vertically disposed rack or frame 14 and a mechanism which guides the same. At the lower side of the work plate 2 and below sewing machine 1 a feed motor 15 is mounted which is arranged in such a manner that it can be switched to the two directions of rotation.

At the operating side of the feed motor 15 (FIG. 5) a plate 16 is securely mounted. The plate 16 is provided with a bore 17 through which extends the motor shaft 18 provided with two ball bearings 19, one of which has a sleeve 20 to which are secured a ratchet wheel 21, a chain or sprocket wheel 22 and a coupling disk 23 of a coupling 24 journaled on the second ball bearing. Besides the coupling disk 23 the coupling 24 comprises essentially a coupling member 25 and a coupling ring 26 which are secured together by means of three bolts 27 and which by means of three springs 29 biased on retaining disks 28 are pressed against coupling linings 30 riveted to both sides of the coupling disk 23. The coupling member 25 is connected to the shaft 18 of the motor by a fitting key 31.

The frame 14 (FIG. 1) has a lower horizontal guide bar which is in the form of a tubular rail 32, to the ends of which vertical bars 33, 34 are secured. Vertically adjustable angular supporting members 36, 37 are secured to these bars at longitudinal slots 35 to provide for adjustment of the height of a horizontal bar 38 secured to the angular members 36, 37. A tightening or tensioning device 39 (FIG. 2) is mounted on the hori-

zontal bar 38 together with the material clamps 40 and a release slide 41. The material clamps 40 can be individually opened manually or in unison by means of a pedal 44 secured to frame 3 (FIG. 1), which by way of a pull cable 43 operates the release slide 41 having recesses 42. The transmission of the opening movement in this connection is effected by way of the hinge members 45 which extend into the path of operation of the release slide 41. A frame-like tube 46 secured at its ends to the angular supporting members 36, 37 serves as a support for the work material 13 which hangs forwardly of the sewing machine.

As illustrated in FIG. 3, two lower bolts 47 are rigidly secured to the plate 16 and two upper eccentric bolts 48 are adjustably secured thereto, each of which is provided with a guiding roller 49. These rollers are formed in such a manner that they partly encompass the runner or rail 32 of the rack or frame 14 which is journaled between them and together with the rail 32 define a pivotal and sliding support for said frame. The frame 14 thus can move axially of the runner 32 to effect a longitudinal movement for advancing between the individual button holes which are to be produced as well as also a pivotal movement about the runner 32 which serves as an axis of rotation as the button holes are being sewed.

A chain 50 is provided for effecting the longitudinal movement of the frame which is arranged above and at a small distance from the guide bar or rail 32 and parallel thereto and secured at both ends to the vertical bars 34, 35. The chain 50 (FIG. 3) is disposed above the chain wheel 22 and is guided along its path by rollers 51.

An exchangeable guiding rail 52 is provided below the rail 32 (FIG. 1) and parallel thereto between the two vertical bars 33 and 34, and cams 53 are provided on the rail 52 for setting the spaces between the individual button holes. By releasing the clamp screws 54 the cams 53 are slidable along the rail and set to the desired distances between button holes. On both sides of the row of the cams 53 reversing cams 55, which are likewise slidable, are arranged for changing the direction of the motor.

An on and off switching device for the longitudinal movement of the frame or rack 14 is also supported on plate 16. Two pawls 56, 57 which are disposed alongside one another and which are journaled on a stud 58 on plate 16 are pressed by means of springs 59 against the ratchet wheel 21 (FIG. 3). The pawls 56, 57 differ from one another in length by half the length of a tooth pitch, thereby making possible smaller spacing between button holes.

Rearwardly of the plate 16 a magnet 60 is mounted, the armature 61 of which is adapted by means of a stud 62 to shift a pull lever 65 which is pivotally mounted in a bore 64 of the plate 16. In the upwardly swung condition the arm 63 actuates a switch 66. The other arm 67 of the pull lever 65 which is bifurcated and arranged at the front of the plate 16 reaches below the two pawls 56, 57 by means of a bolt 68. The bolt 68 has a switch bar 69 pivotally connected thereto, which by means of a slot 70 proximate the lower end thereof is moved along a straight line over the stud 71 which is secured to the plate 16. The lower end of the switch bar 69 (see also FIG. 4) is offset at 72 in a manner that two step-like supporting surfaces 73 and 74 are provided which can engage a projection 75 of a lock slide 76, which is horizontally movable on the plate 16 by means of two stud screws 77 in slots 78. A stud 79 is riveted to the lock slide 76 which carries a cut-off finger 80. A spring 81 which is connected at one end to a hook 82 of the cut-off finger 80 and at the other end to the plate 16, rotates the cut-off finger 80 counterclockwise to engage a pin 83 secured to the lock slide 76 and thus pulls the lock slide 76 to its right end position. The cut-off finger 80 furthermore has a lug 84 which engages the shifting cam 53 and a rectangular cutout 85, into which

extends a driving pin 86 mounted on the shifting bar 69.

Two reversing switches 87, 88 which cooperate with the reversing cams 55 are secured to the plate 16 below the guiding rail 52 for changing the direction of rotation of the feed motor 15.

While the button hole is sewn and the material 13 is moved by the material feed frame 6, the frame 14 is simultaneously swung by the material presser lever 7 by way of the drive bar 89, an extension member 90 and a connecting bar 91, which is in two parts and adjustable in length and which by means of two guide rollers 93 journaled on studs 92 is connected to a guide bar secured to the upper horizontal bar 38.

The arrangement described operates as follows: if the sewing machine 1 is turned on and ready for sewing, the material feed frame 6 is held in raised position by the material presser magnet 8. The frame 14 is then in its starting position, i.e. the lug 84 (FIG. 3) of the cut-off finger 80 engages the first switching or shifting cam 53. Operation of the pedal 44 (FIG. 1) causes opening of the material clamps 40 by way of the pull cable 43, and the material 13 can be introduced into the material clamps 40 underneath the material feed frame 6.

Operating the manual switch 11 first causes the material frame 6 to be lowered, and then the sewing operation is initiated by operation of the on and off lever 10, whereupon the material presser lever 7 swings the frame by way of the described connection and the guide bar 94. Upon completion of the button hole the on and off lever 10 shuts off the machine 1.

The safety contact 12 operated by the on and off lever 10 now closes the circuit to the material presser magnet 8 so that it raises the material feeding frame 6. Simultaneously the safety contact 12 briefly energizes the magnet 60 (FIG. 3) which in turn pulls the arm 63 of the pull lever 65 downwardly, and the bolt 68 secured to the other arm 67 raises the two pawls 56, 57. Thus the ratchet wheel 21 is freed, the coupling disk 23 (FIG. 5) is taken along by the coupling member 25 and the coupling ring 26, and chain wheel 22 pulls the frame 14 to the left by means of the chain 50.

Simultaneously with the raising of the pawls 56, 57 (FIG. 3) the switch bar 69 is raised, the driving pin 86 of which engages the upper edge of the cutout 85 in the cut-off finger 80 and lifts the same over the switch cams 53. By raising the switch bar 69 (FIG. 4) the offset 72 frees the projection 75 of the locking slide 76 so that the latter is pulled into its right end position by the spring 81. The projection 75 of the locking slide 76 now is below the switch bar 69, which after brief pulling up of the magnet 60 is pressed downwardly by the spring biased pawls 56, 57. The supporting surface 73 of the shifting bar 69 then supports itself on the projection 75 of the locking lever 76 and holds the pawls 56, 57 out of engagement with the ratchet wheel 21. During this time the switching bar 69 has lowered itself so that the cut-off finger 80 in its position of rest can engage the hook or stud 83.

The moving of the frame to the left continues until the nearest switch cam 53 engages the lug 84 of the cut-off finger 80 and carries the same along. The locking slide 76 connected with the cut-off finger 80 is pulled to the left until the projection 75 releases the offset 72 of the switch bar 69 and the supporting plane 74 is lowered under the pressure of one of springs 59 (FIG. 3) of the pawls 56, 57 onto the projection 75. The one of the two pawls 56, 57 which is closest to one of the tooth gaps of the ratchet wheel 21 thus drops in and stops the longitudinal movement of the frame 14.

During the lowering of the switch bar 69, the arm 63 of the pull lever 65 was raised sufficiently to operate the switch 66, which interrupts the circuit of the material presser magnet 8 and briefly closes the circuit for the switch on magnet 9. Thus a new sewing operation is initiated, after the end of which the feeding operation as well

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as the sewing are repeated until all switch cams 53 have passed through and the right reversing cam 55 runs onto the reversing switch 87. This switch effects a change in the rotation of the feeding motor 15 so that the frame 14 is drawn into the opposite end position by the chain 50. Simultaneously the reversing switch 87 causes exciting of the magnet 60 so that this magnet, during the return movement of the rack 14, maintains the cut-off finger 80 in raised position by way of the draw bar 65 and the switch bar 69.

In the end position of the frame 14 as the left reversing cam 55 engages the reversing switch 88, the direction of rotation of the feeding motor 15 is changed back to forward movement and simultaneously also the circuits for starting magnet 9 and for magnet 60 are interrupted, so that when the frame 14 is rendered inoperative by the first switching cam 53 as described, no new sewing operation will begin. Furthermore, the reversing switch 88 effects shunting of the switch 66 which, as the frame 14 is stopped, can be actuated by the pull lever 65 without lowering of the material feed frame 6.

Upon removing the work piece 13 from the tensioning arrangement 39, the sewing machine 1 is ready for a new cycle of operations.

Having now described our invention with reference to the embodiment illustrated in the drawings, we do not wish to be limited thereto, but what we desire to protect by Letters Patent of the United States is set forth in the appended claims.

We claim:

1. In combination with a sewing machine of the type adapted to effect group stitching operations supported on a base and having a machine motor and a feeding frame operatively connected to said motor:

- a. a material tightening device operative to retain the material being sewn,
- b. and positioning means including a rack carrying said tightening device and means for moving said rack operative under control of the sewing machine to move said tightening device with the material being sewn in steps in a first direction to the area of stitch formation within said feeding frame,
- c. and guiding means including said feeding frame operative to move the material during the automatic stitching operations of the machine in a direction substantially transversely of said first direction,
- d. said rack being vertically disposed and movably connected to said base and including a lower horizontal guide rail movable longitudinally with said rack and said tightening device in said first direction,
- e. and supporting means including said guide rail and stationary means engaged by said guide rail and mounted on said base and providing pivotal support for movement of said rack and said tightening device in said transverse direction,
- f. and said rack including an upper horizontal rail supporting said tightening device.

2. In combination with a sewing machine of the type adapted to effect group stitching operations supported on a base and having a machine motor and a feeding frame operatively connected to said motor:

- a. a material tightening device operative to retain the material being sewn,
- b. and positioning means including a rack carrying said tightening device and means for moving said rack operative under control of the sewing machine to move said tightening device with the material being sewn in steps in a first direction to the area of stitch formation within said feeding frame,
- c. and guiding means including said feeding frame operative to move the material during the automatic stitching operations of the machine in a direction substantially transversely of said first direction,
- d. said rack being vertically disposed and movably

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connected to said base and including a lower horizontal guide rail movable longitudinally with said rack and said tightening device in said first direction,

- e. and supporting means including said guide rail and stationary means engaged by said guide rail and mounted on said base and providing pivotal support for movement of said rack and said tightening device in said transverse direction,

- f. and said rack including an upper horizontal rail supporting said tightening device,

- g. said guide rail being of circular cross section and said stationary means comprising a plurality of rollers partly encompassing said guide rail.

3. In combination with a sewing machine of the type adapted to effect group stitching operations supported on a base and having a machine motor and a feeding frame operatively connected to said motor:

- a. a material tightening device operative to retain the material being sewn,

- b. and positioning means including a rack carrying said tightening device and means for moving said rack operative under control of the sewing machine to move said tightening device with the material being sewn in steps in a first direction to the area of stitch formation within said feeding frame,

- c. and guiding means including said feeding frame operative to move the material during the automatic stitching operations of the machine in a direction substantially transversely of said first direction,

- d. said rack being vertically disposed and movably connected to said base and including a lower horizontal guide rail movable longitudinally with said rack and said tightening device in said first direction,

- e. and supporting means including said guide rail and stationary means engaged by said guide rail and mounted on said base and providing pivotal support for movement of said rack and said tightening device in said transverse direction,

- f. and said rack including an upper horizontal rail supporting said tightening device,

- g. said guide rail being of circular cross section and said stationary means comprising a plurality of rollers partly encompassing said guide rail,

- h. said positioning means including a rack motor mounted on said base below said machine, a chain, a chain gear in operative engagement with said chain and a coupling device operatively connecting said chain gear to said rack motor, said chain extending parallel to said guide rail and being secured at both ends to said rack.

4. In combination with a sewing machine of the type adapted to effect group stitching operations supported on a base and having a machine motor and a feeding frame operatively connected to said motor:

- a. a material tightening device operative to retain the material being sewn,

- b. and positioning means including a rack carrying said tightening device and means for moving said rack operative under control of the sewing machine to move said tightening device with the material being sewn in steps in a first direction to the area of stitch formation within said feeding frame,

- c. and guiding means including said feeding frame operative to move the material during the automatic stitching operations of the machine in a direction substantially transversely of said first direction,

- d. said rack being vertically disposed and movably connected to said base and including a lower horizontal guide rail movable longitudinally with said rack and said tightening device in said first direction,

- e. and supporting means including said guide rail and stationary means engaged by said guide rail and mounted on said base and providing pivotal support for movement of said rack and said tightening device in said transverse direction,

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- f. and said rack including an upper horizontal rail supporting said tightening device,
- g. said guide rail being of circular cross section and said stationary means comprising a plurality of rollers partly encompassing said guide rail,
- h. said positioning means including a rack motor mounted on said base below said machine, a chain, a chain gear in operative engagement with said chain and a coupling device operatively connecting said chain gear to said rack motor, said chain extending parallel to said guide rail and being secured at both ends to said rack,
- i. and said stationary means including a support plate secured to said base and connected to said rack motor and supporting said coupling device, said rollers and said guide rail and thereby said rack.
5. In combination with a sewing machine of the type adapted to effect group stitching operations supported on a base and having a machine motor and a feeding frame operatively connected to said motor:
- a. a material tightening device operative to retain the material being sewn,
- b. and positioning means including a rack carrying said tightening device and means for moving said rack operative under control of the sewing machine to move said tightening device with the material being sewn in steps in a first direction to the area of stitch formation within said feeding frame,
- c. and guiding means including said feeding frame operative to move the material during the automatic stitching operations of the machine in a direction substantially transversely of said first direction,
- d. said rack being vertically disposed and movably connected to said base and including a lower horizontal guide rail movable longitudinally with said rack and said tightening device in said first direction,
- e. and supporting means including said guide rail and stationary means engaged by said guide rail and mounted on said base and providing pivotal support for movement of said rack and said tightening device in said transverse direction,
- f. and said rack including an upper horizontal rail supporting said tightening device,
- g. said guide rail being of circular cross section and

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- said stationary means comprising a plurality of rollers partly encompassing said guide rail,
- h. said positioning means including a rack motor mounted on said base below said machine, a chain, a chain gear in operative engagement with said chain and a coupling device operatively connecting said chain gear to said rack motor, said chain extending parallel to said guide rail and being secured at both ends to said rack,
- i. said stationary means including a support plate secured to said base and connected to said rack motor and supporting said coupling device, said rollers and said guide rail and thereby said rack,
- j. and an exchangeable guiding rail disposed on said rack parallel to and below said lower guide rail, a plurality of adjustable control cams and a pair of reversing cams mounted on said guiding rail, a disengaging member associated with said coupling means and mounted on said plate and having a finger extending into the path of movement of said control cams, and a pair of reversing switches associated with said rack motor and mounted on said plate, each adapted to be engaged by one of said reversing cams.
6. Apparatus in accordance with claim 5 wherein said coupling device is in the form of a sliding coupling and includes a driving portion and a ratchet wheel mounted proximate said chain gear, a pair of pawls pivotally supported on said plate on a bolt and having their ends displaced by half the length of the distance between two teeth on said ratchet wheel, said bolt pivotally connecting a draw lever controlled by a magnet on the sewing machine and a draw bar having two positions of operation, and a locking slide operatively associated with said control cams and said draw bar for interrupting the movement of said rack.

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