Dec. 19, 1950 H. DIAMOND 2,534,701

SEWING MACHINE FOR ELASTIC SEAMS

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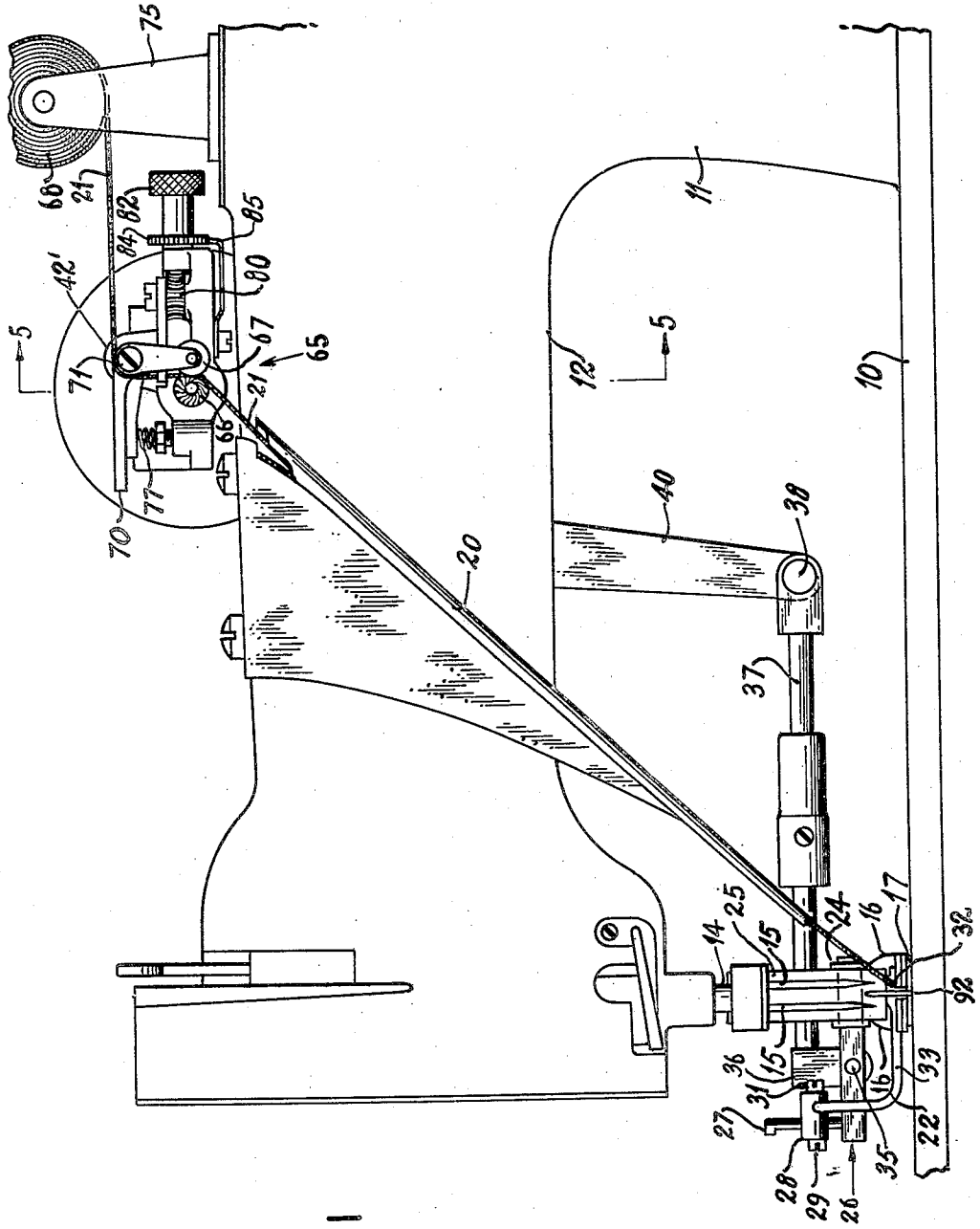


FIG. 1

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SEWING MACHINE FOR ELASTIC SEAMS

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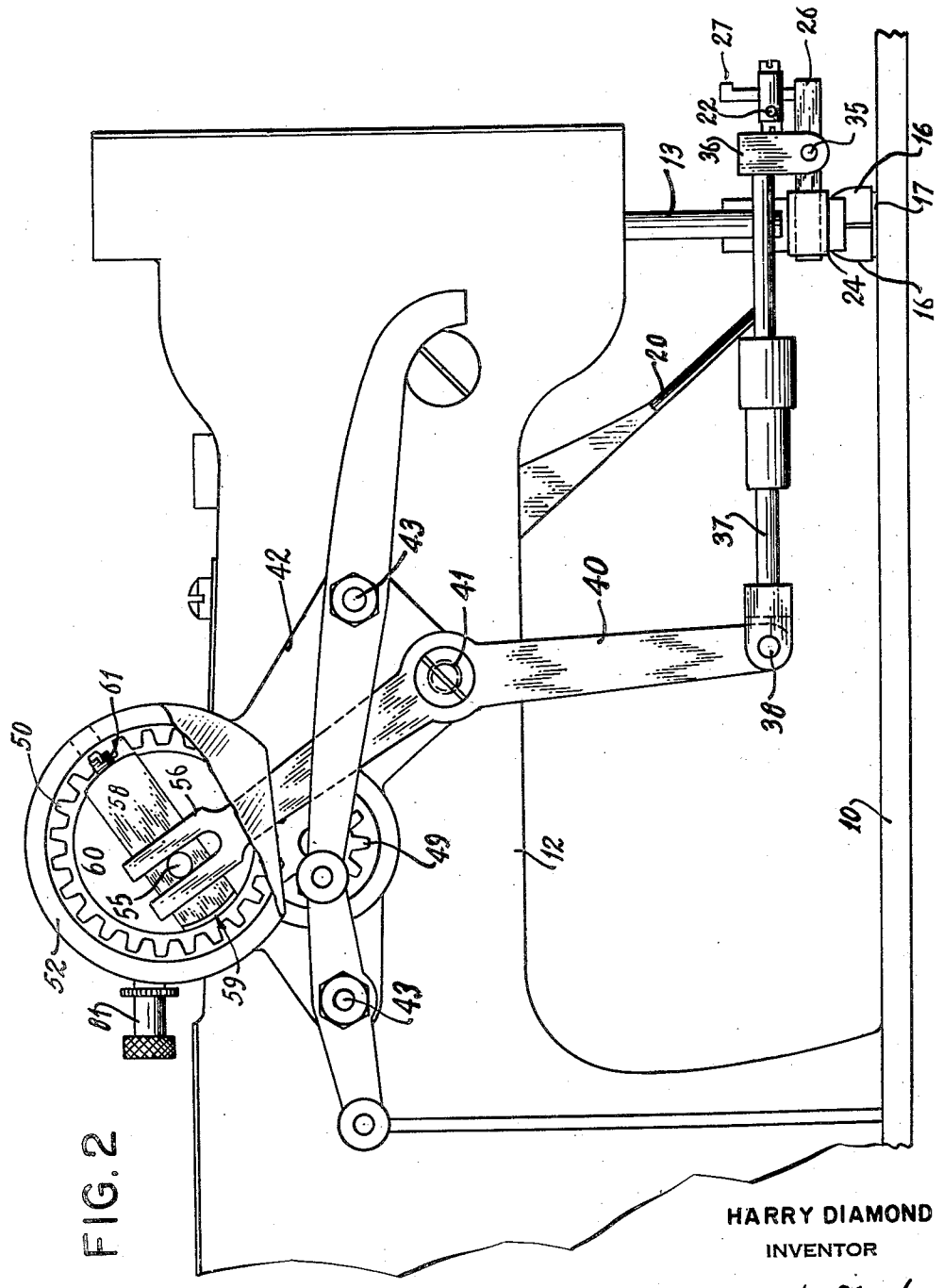


FIG. 2

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SEWING MACHINE FOR ELASTIC SEAMS

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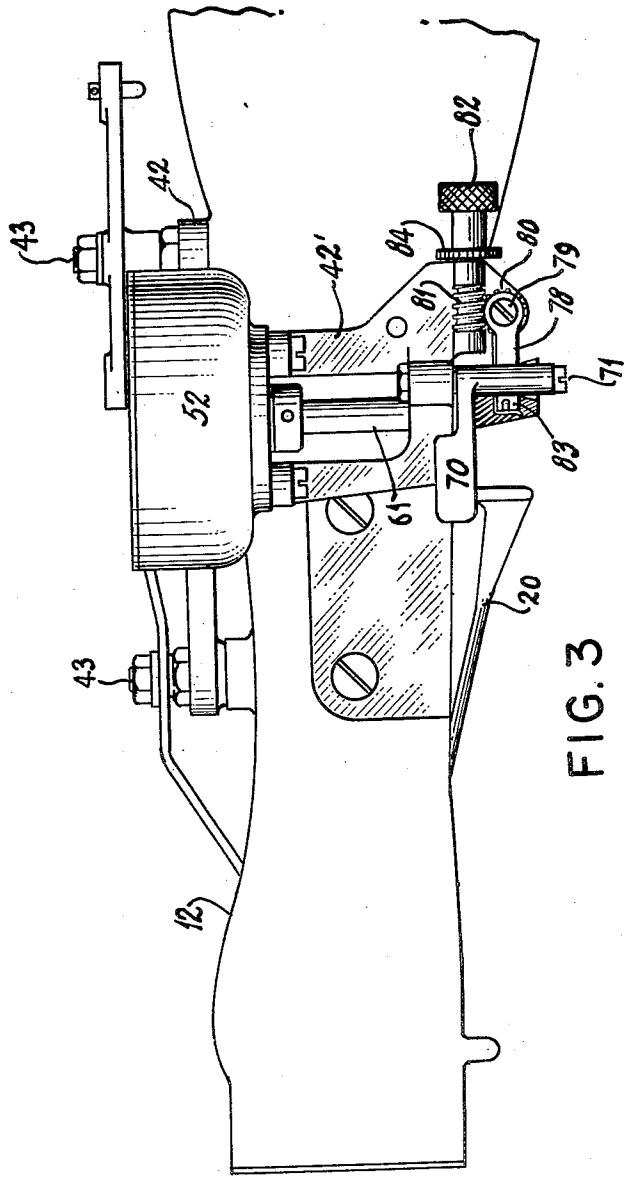


FIG. 3

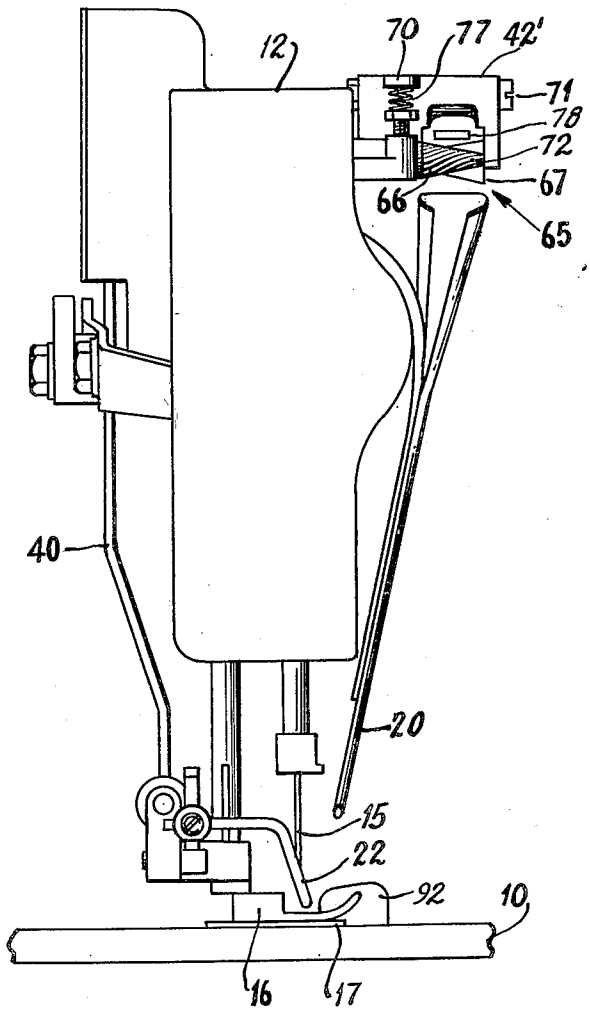
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SEWING MACHINE FOR ELASTIC SEAMS

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FIG. 4



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SEWING MACHINE FOR ELASTIC SEAMS

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FIG. 5

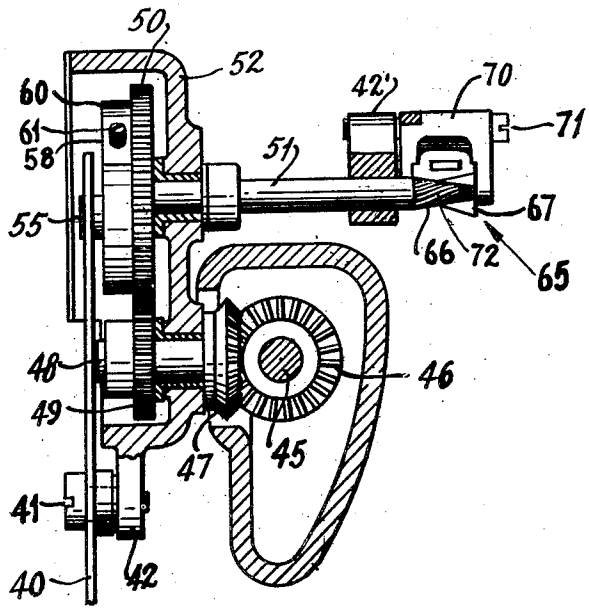
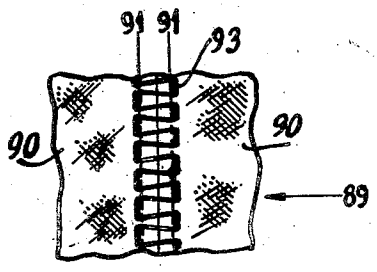


FIG. 6



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Patented Dec. 19, 1950 2,534,701

UNITED STATES PATENT OFFICE

2,534,701

SEWING MACHINE FOR ELASTIC SEAMS

Harry Diamond, New York, N. Y.

Application February 5, 1949, Serial No. 74,739

11 Claims. (Cl. 112—100)

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This invention relates to improvements in sewing machines, and more particularly to a mechanism for stitching elastic seams having an elastic thread cross-stitch throughout the entire length of the seams, the seams being fully disclosed in my Patent No. 2,141,239, dated December 27, 1938.

The main object of this invention is to provide a cross-thread laying mechanism comprising an auxiliary feeding mechanism for positively and uniformly feeding an elastic thread in timed relation with the main feeding mechanism of the sewing machine to insure the formation of a perfect elastic seam.

Another object of this invention is to provide a pair of cooperating tapering feed rollers, one of which is driven by the needle-bar shaft and forming the auxiliary feeding mechanism, and to provide an elongated guide for preventing any whipping motions of the elastic thread between the auxiliary and the main feeding mechanisms.

Another object of this invention is to provide means for shifting the elastic thread axially of the tapering rollers for adjusting the rate of speed of the elastic thread to equal the predetermined rate of speed of the main feeding mechanism for preventing stretching of the elastic thread.

Another object of this invention is to provide a cross-thread laying hook carrier slidably mounted on the presser-foot and in right-angular relation with the line of seam formation and reciprocated due to the motion of the needle-bar shaft during all up and down positions of the presser-foot under operating conditions.

With the above and other objects in view, the invention will be hereinafter more particularly described, and the combination and arrangement of parts will be shown in the accompanying drawings and pointed out in the claims which form part of this specification.

Reference will now be had to the drawings, wherein like numerals of reference designate corresponding parts throughout the several views, in which:

Figure 1 is a front view of a standard sewing machine equipped with my invention.

Figure 2 is a rear view of the machine.

Figure 3 is a top plan view of the machine showing the elastic thread feeding mechanism.

Figure 4 is an end elevation of the machine.

Figure 5 is a cross-sectional view taken on line 5—5 in Figure 1.

Figure 6 is a plan view of an enlarged fragmentary portion of two adjoining panels of a

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garment showing an elastic seam comprising an elastic cross-stitch.

In the illustrated embodiment of the invention the numeral 10 indicates the work supporting base of a sewing machine to which my invention is applied. The sewing machine comprises an overhanging arm consisting of the upright portion 11 and overhanging portion 12. The sewing machine has stitch forming mechanism, including a presser-foot bar 13, and needle-bar 14, carried by the overhanging portion 12. The presser-foot bar has the usual spring for applying pressure.

The needle-bar 14 is fitted with two laterally spaced needles 15, so that both sides of a complete elastic lock stitch seam may be sewed in a garment at the same time. A two-piece presser-foot 16 is suitably secured to the presser-foot bar. The sewing machine has a needle feed wherein the needles 15 move with the feed dog 17 defining the main feeding mechanism.

Cooperating with the needles 15 above the work supporting base 10, is a cross-thread laying mechanism consisting of a fixed guide 20 for an elastic thread 21 and a thread hook 22 which moves across the line of feed. The thread hook 22 engages the elastic thread 21 passing through the thread guide 20 and forms loops for the entrance of the needles.

The cross thread joins the needle threads on the upper face of the fabric. Cooperating with the needles beneath the work support is a suitable looper (not shown), which connects the needle threads beneath the fabric sections worked upon.

A guideway 24 is fixed to the rearward face of the presser-foot body 25. The guideway 24 is of square cross-section. An elongated carrier 26 of square cross-section is slidably mounted in the guideway 24 in non-rotatable relation therewith. An upright pin 27 is suitably fixed in the slide member 26 and has a dog 28 vertically adjustable thereon by a screw 29.

The cross-thread laying hook 22 is secured by a screw 31 to the dog 28 and has an aperture 32 in a horizontal extension 33 thereof through which the elastic thread 21 is fed rearwardly in direction of the line of seam formation. A pin 35 extends reawardly from the carrier 26 and provides a pivot on which an arm 36 is mounted for oscillating motion. The arm 36 has an elongated horizontal extension 37 which terminates in a pivotal junction 38.

As best shown in Figure 2, a lever 40 is pivotally mounted on a pin 41 in a bracket 42 which

is fixed to the over-hanging arm 12 by bolts 43. The lower end of the lever 40 is in engagement with the junction 38.

As best shown in Figure 5, the actuating mechanism for the lever 40 of the cross-thread laying mechanism comprises the needle-bar shaft 45 and a bevel gear 46 fixed thereon, and which engages with a bevel gear 47 carried by a transverse shaft 48. The transverse shaft 48 has a gear 49 mounted thereon and which is in meshed relation with a larger gear 50 fixed to a shaft 51 in a housing 52 which forms part of the bracket 42.

The large gear 50 has an eccentric 55 adjustably mounted thereon. The upper portion of the lever 40 has a forked end 56 in engagement with the eccentric 55.

The eccentric 55 is integral with a slide block 58. The slide block 58 is mounted in a guideway 59 in a gear hub 60 which is fixed to an end of the shaft 51. A screw 61 threaded in the slide block 58 is suitably arranged to cause a sliding motion of the eccentric 55 to or from the center of the shaft 51. By adjusting the screw 61, the "throw" of the lever 40, and the reciprocations of the thread hook 22 is varied.

Auxiliary feeding mechanism 65 is provided for positively feeding the elastic thread 21 to the main feeding mechanism 17 and comprises a pair of cooperating feed rollers 66 and 67, the rollers being mounted with the smallest ends facing in opposite directions.

A bell-crank lever 70 is mounted on a pin 71 in a bracket extension 42' and carries the tapering roller 67, the exterior surface of which is made smooth. The roller 66 has serrations 72 cut therein all along its length.

A bracket 75 is suitably supported on the overhanging arm 12 or in any other suitable manner, and carries a roll 68 of elastic thread 21 which passes over the forward portion of the lever 70, between the rollers 66 and 67, and passes into and through the elongated guide 20 and then through the aperture 32 in the thread finger 22. A coil spring 77 is mounted to exert upward pressure against the free end of the bell-crank lever 70 and causes the roller 67 to resiliently press against the roller 66.

When the shaft 51 rotates, the roller 66 rotates in feeding direction to feed the elastic thread to the main feeding mechanism 17, the spring-pressed roller 67 coacts in the feeding operation.

A threading arm 78 is pivoted on a pin 79 in the bracket extension 42'. The pin 79 has a gear 80 mounted thereon and in meshed engagement with a worm 81 carried by a rotatable spindle 82. The threading arm 78 has a spring-closed aperture 83 through which the elastic thread 21 is threaded. The spindle 82 carries a gear 84. A leaf spring 85 suitably fixed below the gear 84 has an upward extension in pressure engagement with one of the teeth in the gear and retains the gear in set position.

By rotating the spindle 82 and the gear 84, the free end of the threading arm 78 swings in an arc and shifts the elastic thread 21 axially of the rollers and this adjusts the rate of speed of the elastic thread. This adjustment makes possible the feeding of the elastic thread through the auxiliary feeding mechanism 65 to equal the predetermined speed of the main feeding mechanism 17 and prevents stretching of the elastic thread 21 during seam formation.

The elastic seam 89 made by the mechanism

herewith, is shown in Figure 6 and comprises two side edges of adjacent panels 90, 90. The side edges are separately folded and stitched to form hems. The hemmed fabric is placed on the work supporting base 10 and guided by an upright central rib 92 to the needles 15 and stitched by two parallel rows of straight-line stitching 91, 91, using non-elastic threads. The raw edges of the fabric are concealed inside the folds. The parallel rows of non-elastic straight-line stitching are interlocked with a cross-stitch 93 using the elastic thread 21 which is positioned intermediate the fabric and the straight-line stitching.

The spaced rows of straight-line stitching serve for anchoring the cross-stitches to the fabric. The folded side edges of the panels 90 lie flat in a single plane and so that the seam has no undue bulkiness. The hems face in opposite directions.

It will be noted that the hemmed fabric edges are normally in adjoining or abutting relation and so that when the two sections of fabric are stretched transversely, the side edges of the panels will be temporarily pulled apart and provide a linear opening for ventilation but will immediately close back to the normal adjoining relation when the distending stresses are relieved.

The length of each of the cross-threads is substantially the same as the distance between the two rows of straight-line stitching so as to normally connect and hold the folded edges in flat and abutting relation and prevent the edges from being spaced apart or from being in overlapping relation. In Figure 6, the straight-line stitching forming the two hems is not shown.

It is to be noted that the diameter of the gear 50 is twice as large as the diameter of the gear 49 and this speed reducing ratio causes two stitches to be formed by each of the needles 15 for each motion of the cross-thread laying hook 22.

In accordance with the patent statutes I have described and illustrated the preferred embodiment of my invention, but it will be understood that various changes and modifications can be made therein without departing from the spirit of the invention as defined by the appended claims.

I claim:

1. In combination with a sewing machine having a main feeding mechanism and a presser-foot and a shaft mounted in an upper arm of said sewing machine and transverse with the needle-bar shaft, said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, said transverse shaft having further gear means operated thereby, said further gear means including an eccentric, a cross-thread laying hook carrier slidably mounted on said presser-foot in right-angular relation with the line of seam formation, said carrier having a horizontal extension above said work supporting base and terminating in a forked end portion, a lever having its upper end in engagement with said eccentric, the lower end of said lever being in engagement with said forked end portion, whereby said cross-thread laying hook is constrained to reciprocate solely due to the motion of said needle-bar shaft, said forked junction permitting said reciprocating motions of said cross-thread laying hook during all up and down positions of said presser-foot under operating conditions, auxiliary feeding means on

said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, yielding means for urging one of said rollers toward the other roller, means connected to said needle-bar shaft for rotating one of said rollers in feeding direction at a rate of speed equal to the rate of speed of said main feeding mechanism, an elastic thread passing between said rollers and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

2. In combination with a sewing machine having a main feeding mechanism and a presser-foot and a shaft mounted in an upper arm of said sewing machine and transverse with the needle-bar shaft, said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, said transverse shaft having speed reducing gear means operated thereby, said speed reducing gear means including an eccentric, a cross-thread laying hook carrier slidably mounted on said presser-foot in right-angular relation with the line of seam formation, said carrier having a horizontal extension above said work supporting base and terminating in a junction permitting up and down movements, a lever having its upper end in engagement with said eccentric, the lower end of said lever being in engagement with said junction, said junction permitting said reciprocating motions of said cross-thread laying hook during all up and down positions of said presser-foot, whereby said cross-thread laying hook is constrained to reciprocate due to the motion of said needle-bar shaft, auxiliary feeding means on said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, yielding means for urging one of said rollers toward the other roller, means connected to said needle-bar shaft for rotating one of said rollers in feeding direction at a rate of speed equal to the rate of speed of said main feeding mechanism, an elastic thread passing between said rollers and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

3. In combination with a sewing machine having a main feeding mechanism below a work supporting base and a presser-foot, and a shaft mounted in an upper arm of said sewing machine and transverse with the needle-bar shaft; said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, said transverse shaft having speed reducing gear means and an eccentric operated thereby, a cross-thread laying hook carrier slidably mounted on said presser-foot in right-angular relation with the line of seam formation, said carrier having a horizontal extension above said work supporting base and terminating in a pivotal junction, a lever having its upper end in engagement with said eccentric, the lower end of said lever being in engagement with said junction, said junction permitting reciprocating motions of said cross-thread laying hook during all up and down positions of said presser-foot, said cross-thread laying hook being constrained to reciprocate due to the motion of said needle-bar shaft, auxiliary feeding means on said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, yielding means for urging one of said rollers toward the other roller, means operatively connected with said needle-bar shaft for rotating one of said rollers in feeding direction at a rate of speed equal to the rate of speed of said main feeding mechanism, an elastic thread passing between said rollers, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

4. In combination with a sewing machine having a main feeding mechanism below a work supporting base and presser-foot, and a shaft mounted in an upper arm of said sewing machine and transverse with the needle-bar shaft; said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, said transverse shaft having speed reducing gear means and an eccentric operated thereby, a cross-thread laying hook carrier slidably mounted on said presser-foot in right-angular relation with the line of seam formation, said carrier having a horizontal extension above said work supporting base and terminating in a pivotal junction, a lever fulcrumed in said upper arm and having its upper end in engagement with said eccentric, the lower end of said lever being in engagement with said junction, means for adjusting said eccentric, said junction permitting reciprocating motions of said cross-thread laying hook during all up and down positions of said presser-foot, said cross-thread laying hook being constrained to reciprocate due to the motion of said needle-bar shaft, auxiliary feeding means on said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, yielding means for urging one of said rollers toward the other roller, means operatively connected with said needle-bar shaft for rotating one of said rollers in feeding direction, an elastic thread passing between said rollers, means for guiding said elastic thread between said auxiliary and said main feeding mechanism, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

5. In combination with a sewing machine having a main feeding mechanism below a work supporting base and a presser-foot, and a shaft mounted in an upper arm of said sewing machine and transverse with the needle-bar shaft; said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, an eccentric operatively associated with said transverse shaft, a cross-thread laying hook carrier slidably mounted on said presser-foot in right-angular relation with the line of seam formation, said carrier having a horizontal extension above said work supporting base and terminating in a pivotal junction, a lever fulcrumed in said upper arm and having its upper end in engagement with said eccentric, the lower end of said lever being in engagement with said

junction, means for adjusting said eccentric, said junction permitting reciprocating motions of said cross-thread laying hook during all up and down positions of said presser-foot, said cross-thread laying hook being constrained to reciprocate due to the motion of said needle-bar shaft, auxiliary feeding means on said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, said rollers being mounted with the smallest ends facing in opposite directions, yielding means for urging one of said rollers toward the other roller, means operatively connected with said needle-bar shaft for rotating one of said rollers in feeding direction, an elastic thread passing between said rollers, means for guiding said elastic thread between said auxiliary and said main feeding mechanism, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

6. In combination with a sewing machine having a main feeding mechanism below a work supporting base and a presser-foot, and a shaft mounted in an upper arm of said sewing machine and transverse with the needle-bar shaft; said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, an eccentric operatively associated with said transverse shaft, a guideway carried by said presser-foot, a cross-thread laying hook carrier slidably mounted in said presser-foot guideway in right-angular relation with the line of seam formation, said carrier having a horizontal extension pivotally mounted thereon and terminating in a pivotal junction, a lever fulcrumed in said upper arm and having its upper end in engagement with said eccentric, the lower end of said lever being in engagement with said pivotal junction, means for adjusting said eccentric, said pivotally mounted extension and said junction permitting reciprocating motions of said cross-thread laying hook during all up and down positions of said presser-foot, said cross-thread laying hook being constrained to reciprocate due to the motion of said needle-bar shaft, auxiliary feeding means on said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, said rollers being mounted with the smallest ends facing in opposite directions, yielding means for urging one of said rollers toward the other roller, means operatively connected with said needle-bar shaft for rotating one of said rollers in feeding direction, means for supporting an elastic thread for passage between said rollers, means for guiding said elastic thread between said auxiliary and said main feeding mechanism, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

7. A mechanism for producing elastic seams, comprising in combination with a sewing machine having a main feeding mechanism below a work supporting base and a presser-foot, and a shaft mounted in an upper arm of said sewing machine and transverse with the needle-bar shaft; said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means

mounted on said transverse shaft for driving said shaft, an eccentric operatively associated with said transverse shaft, a guideway carried by said presser-foot, a cross-thread laying hook carrier slidably mounted in said presser-foot guideway, said carrier having a horizontal extension pivotally mounted thereon and terminating in a pivotal junction, a lever fulcrumed in said upper arm and having its upper end in engagement with said eccentric, the lower end of said lever being in engagement with said pivotal junction, means for adjusting said eccentric, said pivotally mounted extension and said junction permitting reciprocating motions of said cross-thread laying hook during up and down positions of said presser-foot, said cross-thread laying hook being constrained to reciprocate due to the motion of said needle-bar shaft, auxiliary feeding means on said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, said rollers being mounted with the smallest ends facing in opposite directions, yielding means for urging one of said rollers toward the other roller, means operatively connected with said needle-bar shaft for rotating one of said rollers in feeding direction, means for supporting an elastic thread for passage between said rollers, tubular means for guiding said elastic thread between said auxiliary and said main feeding mechanism, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said elastic thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

8. A mechanism for producing elastic seams, comprising in combination with a sewing machine having a main feeding mechanism below a work supporting base and a presser-foot and an upper arm supporting a needle-bar shaft; a shaft mounted in said upper arm and transverse with said needle-bar shaft, said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, an eccentric operatively associated with said transverse shaft, a guideway carried by said presser-foot, a cross-thread laying hook carrier slidably mounted in said presser-foot guideway, a lever fulcrumed in said upper arm and having its upper end in engagement with said eccentric, means connecting the lower end of said lever with said carrier, auxiliary feeding means on said upper arm for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, said rollers being mounted with the smallest ends facing in opposite directions, yielding means for urging one of said rollers toward the other roller, means operatively connected with said needle-bar shaft for rotating one of said rollers in feeding direction, means for supporting an elastic thread for passage between said rollers, means for guiding said elastic thread between said auxiliary and said main feeding mechanism, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said elastic thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

9. A mechanism for producing elastic seams, comprising in combination with a sewing machine having a main feeding mechanism below a work supporting base and a presser-foot and an upper arm supporting a needle-bar shaft; a shaft

mounted transversely with said needle-bar shaft, said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, an eccentric operatively associated with said transverse shaft, a guideway carried by said presser-foot, a cross-thread laying hook carrier slidably mounted in said presser-foot guideway, a lever fulcrumed in said upper arm and having its upper end in engagement with said eccentric, means connecting the lower end of said lever with said carrier, auxiliary feeding means for positively feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, said rollers being mounted with the smallest ends facing in opposite directions, yielding means for urging one of said rollers toward the other roller, means operatively connected with said needle-bar shaft for rotating one of said rollers in feeding direction, means for guiding an elastic thread between said auxiliary and said main feeding mechanism, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said elastic thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

10. A mechanism for producing elastic seams, comprising in combination with a sewing machine having a main feeding mechanism below a work supporting base and a presser-foot and an upper arm supporting a needle-bar shaft; a shaft mounted transversely with said needle-bar shaft, said needle-bar shaft having gear means mounted thereon and being intermeshed with gear means mounted on said transverse shaft for driving said shaft, an eccentric operatively associated with said transverse shaft, a guideway carried by said presser-foot, a cross-thread laying hook carrier slidably mounted in said presser-foot guideway, a lever fulcrumed in said upper arm and having its upper end in engagement with said eccentric, means connecting the lower end of said lever with said carrier, auxiliary feeding means for feeding elastic thread to said main feeding mechanism comprising a pair of cooperating tapering feed rollers, yielding means for urging one of said rollers toward the other roller, means for rotating one of said rollers in feeding direction, means for guiding an elastic thread between said auxiliary feeding means and said main feeding mechanism, and means for shifting said elastic thread axially of said rollers for adjusting the rate of speed of said elastic thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

11. A mechanism for producing elastic seams, comprising in combination with a sewing machine having a main feeding mechanism and a presser-foot and an arm supporting a needle-bar shaft; a shaft mounted transversely with said needle-bar shaft, said needle-bar shaft having gear means mounted thereon and intermeshed with gear means mounted on said transverse shaft, an eccentric operatively associated with said transverse shaft, a guideway carried by said presser-foot, a cross-thread laying hook carrier slidably mounted in said guideway, a lever having one end in engagement with said eccentric, means connecting the other end of said lever with said carrier, auxiliary feeding means for feeding elastic thread to said main feeding mechanism, means for guiding an elastic thread from said auxiliary feeding means to said main feeding mechanism, and means for adjusting the rate of speed of said elastic thread to equal the predetermined speed of said main feeding mechanism for preventing stretching of said elastic thread during seam formation.

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No references cited.