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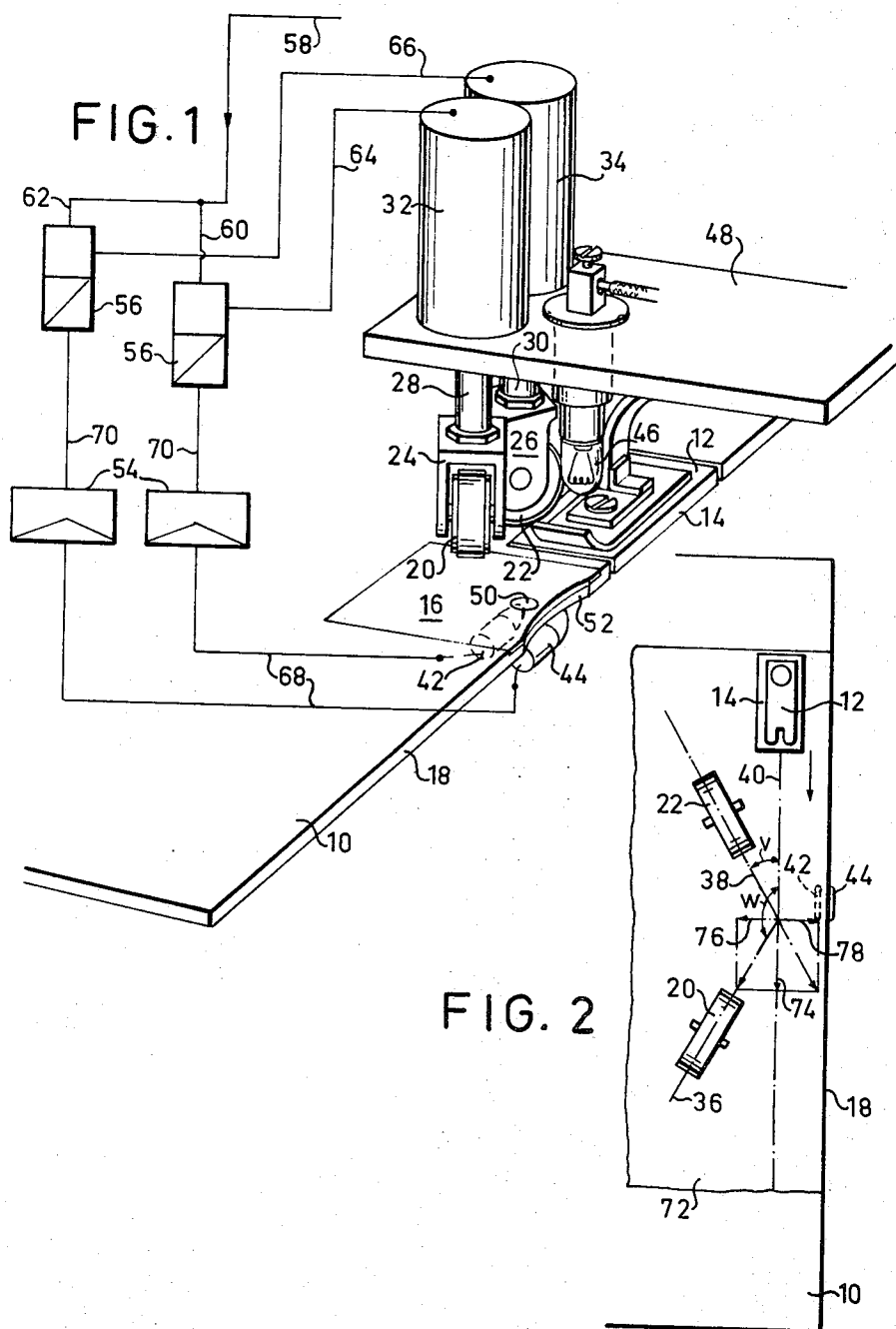
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SYSTEM FOR AUTOMATIC GUIDING THE WORK IN A SEWING MACHINE

Filed March 21, 1966

2 Sheets-Sheet 1



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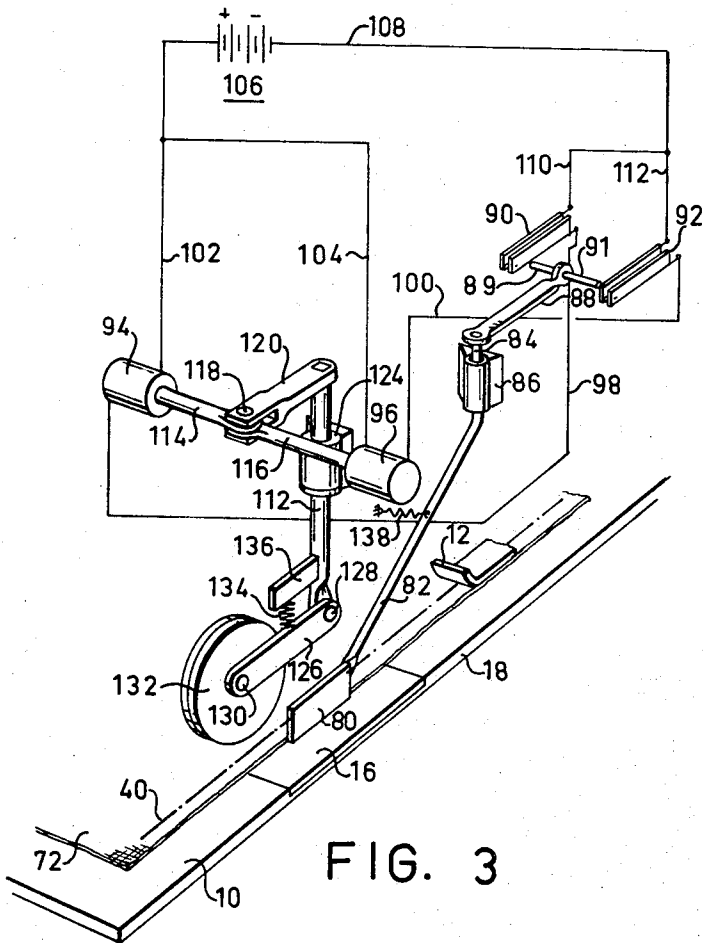


FIG. 3

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SYSTEM FOR AUTOMATICALLY GUIDING THE WORK IN A SEWING MACHINE

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4 Claims. (Cl. 112—203)

ABSTRACT OF THE DISCLOSURE

A sewing machine is provided with a device for maintaining a line of stitching parallel to the edge of the fabric. Adjacent the presser foot, there is provided a device for sensing lateral deviation of the edge of the fabric. Responsive to this sensing means, one or more rollers contacts the fabric at an angle to shift the fabric in a direction perpendicular to the axis of the roller. The edge sensing may be done either photo-electrically or mechanically. The shifting roller may be in the form of two angularly related rollers alternately selectively individually engageable with the fabric, or by a single roller whose axis is angularly shiftable in a horizontal plane.

A seam in a piece of cloth or other work is usually sewn along an edge and at a constant distance therefrom, the so called allowance for the seam. The most important task for the seamstress from the point of view of quality is often to keep this distance constant. The seamstress makes corrections during the sewing operation by moving the work laterally ahead of the presser foot of the sewing machine such that the position of the needle relative to the edge of the piece of cloth will be correct. Such correcting work requires much practice and skill, but can nevertheless, not always result in an entirely correct allowance. The object of this invention is to eliminate this difficulty and to render possible automatic guiding of the work relative to the direction, hereinbelow termed the direction of feed, in which the feed mechanism of the sewing machine is intended to advance the work.

In its broadest aspect the invention is characterized in that a member sensitive to the position of the edge of the work is coupled in such a manner to a device adapted to adjust the work laterally relative to the direction in which the feed mechanism of the sewing machine is devised to advance the work that said adjusting device upon lateral displacement of the work receives an impulse for returning the work to correct position.

If a cloth or fabric is pulled forward under a roller which is in contact with the cloth it will be observed that the cloth below the roller will not move in the pulling direction, but at right angles to the axis of the roller, i.e., parallel to the plane of rotation of the roller, unless the pulling direction lies in the plane of rotation. One embodiment of the invention is based on this observation and is characterized in that the adjusting device comprises rollers rotatably mounted on shafts which are positioned such that the planes of rotation of the rollers make angles other than right ones with the direction of feed of the sewing machine, the plane of rotation of one roller making an acute angle and the plane of rotation of another roller making an obtuse angle with the direction of feed. The rollers are carried by holders adapted to move the rollers alternatively into engagement with the work if the work happens to displace itself laterally relative to the direction of feed, whereby to have the work returned to correct lateral position by the work-engaging roller. As a

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result the work will be guided so as to ensure the desired position of the seam, for instance relative to an edge of the work.

The roller holders may be actuated in response to the position of the edge of the work by photoelectric cells which are responsive to lateral displacement of said edge relative to the direction of feed. As a result thereof the work will be guided entirely automatically without any manual operation for this purpose.

According to a second embodiment of the invention the member sensitive to the position of the edge of the work comprises a slide shoe arranged to be in contact with said edge and adapted upon lateral movements to actuate relays which alternatively close a circuit across one or the other of a pair of electromagnets which in turn are adapted to actuate the adjusting device.

Further features of the invention and advantages obtained thereby will appear from the following description of embodiments of the invention illustrated in the annexed drawings. FIG. 1 is a diagrammatic perspective view of the entire first embodiment, FIG. 2 is a simplified horizontal projection explaining the guiding principle in this embodiment, and FIG. 3 is a perspective view of a second embodiment.

Referring to FIGS. 1 and 2 of the drawings, reference numeral 10 denotes the table of a sewing machine, numeral 12 denotes the presser foot of the sewing machine and numeral 14 denotes the feed mechanism located below the presser foot. Inserted in the table is a work supporting plate 16 of comparatively low surface friction. On this plate the work is advanced by the feed mechanism of the sewing machine in a direction parallel to the front edge 18 of the table. In the embodiment exemplified that edge of the work along which the seam is to be made is assumed to extend exactly right above the edge 18 of the table provided that the seam is correctly positioned relative to the edge of the work, that is at a constant distance therefrom.

Slightly above the work supporting plate 16 inserted in the table 10 there is provided a pair of rollers 20 and 22. The rollers are mounted on shafts carried by holders 24, 26 which are secured to the pistons 28, 30 of pneumatic cylinders 32, 34. The planes of rotation of the rollers 20, 22 are oblique relative to the direction of feed. As will be seen from FIG. 2, the plane of rotation 38 of the roller 22 makes an acute angle ν with the direction of feed 40, whereas the plane of rotation 36 of the other roller 20 makes an obtuse angle w with the direction of feed 40. In FIG. 2 the planes of rotation and the direction of feed are indicated by chain-dotted lines. The rollers 20, 22 are intended to be moved alternatively into engagement with the work when the work is to be displaced laterally in one or the other direction relative to the direction of feed. The required movement of the rollers is induced by a pair of photoelectric cells 42, 44 on which light can fall from a source of light 46 in the form of a lamp which is mounted on a bracket or supporting plate 48 secured to the frame of the sewing machine. The pneumatic cylinders 32, 34 are also mounted on the plate 48. Above the photoelectric cell 42 an aperture 50 for the light is provided in the table 10 and the plate 16, and above the photoelectric cell 44 the table 10 has a marginal recess 52 for the same purpose. The photoelectric cells 42, 44 are located relatively close to each other. The impulse from each photoelectric cell is amplified in an individual amplifier 54 and actuates a solenoid valve 56 which controls the supply of a medium under pressure to the pneumatic cylinders 32, 34. Medium under pressure is admitted to the pressure chambers of the solenoid valves 56 through a supply line 58 and branch lines 60, 62. The solenoid valves communicate with the pneumatic working cylin-

ders 32 and 34 through lines 64 and 66, respectively. Conductors 68 transmit the impulses from the photoelectric cells 42, 44 to the amplifiers 54, and the amplified impulses are transmitted through conductors 70 to the coils of the solenoid valves 56.

The mode of operation of the system described is substantially as follows.

A piece of work 72 (FIG. 2) is to be advanced in the direction indicated by the line 40 and it is desired that the seam be coincident with the line 40 which is parallel to the edge of the work and consequently to the edge 18 of the table 10. In that case the edge of the work is exactly right above the middle of the space between the photoelectric cells 42, 44. In this position the work covers the photoelectric cell 42 whereas the other cell 44 is located outside the edge of the work and exposed to the light. Consequently, the light from the lamp 46 can fall on the photoelectric cell 44, but not on the photoelectric cell 42. If now the work for some reason or other is displaced for instance to the left in FIG. 2 and light can fall through the aperture 50 on the photoelectric cell 42 impulses from both photoelectric cells after amplification will actuate the solenoid valves 56 resulting in that air under pressure or other working medium will be supplied to the pneumatic cylinders 32, 34. These cylinders are coupled such that their pistons which carry the roller holders are assuming upper positions in the cylinders when the edge of the work is in correct position right above the middle of the space between the photoelectric cells 42, 44. However, if both photoelectric cells 42, 44 are exposed one of the rollers will be forced down into engagement with the work. If in accordance with the above example the work has been displaced to the left as viewed in FIG. 2 and both photoelectric cells are exposed the roller 22 will be moved into engagement with the work which consequently will be displaced in the direction of the line 38 in FIG. 2 until the edge of the work again is located right above the middle of the space between the photoelectric cells. Thereupon the roller 22 will be immediately lifted. If instead thereof the work has been displaced to the right and has obscured both photoelectric cells the roller 20 will be forced into engagement with the work which then will be guided along the line 36 in FIG. 2 and returned to correct position. The return movements of the work can be considered to be composed of a movement 74 in the direction of feed and a movement at right angles thereto, as indicated by the arrow 76 or 78.

The invention is not limited to the embodiment described above. The operation described is in the first place applicable, for instance, to overcasting of the edge of a single piece of cloth in which the seam is to extend close and parallel to the edge of the cloth. If two layers of cloth are to be sewn together by a seam, the system described may principally be used except that two oblique rollers and two photoelectric cells are provided for each layer. In such case one set of rollers and photoelectric cells is adapted to work on the upper layer from the upper side thereof, whereas the other set is adapted to work on the lower layer from the lower side thereof. All of the four photoelectric cells are preferably disposed in a plate between the layers. In this way even two pieces of cloth of different curvature can be united with correct allowances for both layers.

Instead of pneumatic cylinders with pistons elastic bellows may be used for effecting the movements of the roller holders. These movements may be effected directly by electromagnets which receive currents from the amplifiers 54.

In the second embodiment illustrated in FIG. 3 the member sensitive to the position of the edge of the work is a slide shoe 80 mounted on a crank arm 82 which is fixed to a vertical shaft 84. This shaft is guided in a fixed bearing 86 and the upper end of the shaft carries an arm 88 having a pair of laterally projecting pins 89, 91

which alternatively act upon one or the other of a pair of relays 90, 92. The relay 90 is connected to the coil of an electromagnet 94 and the other relay is similarly connected to an electromagnet 96, the connections being in the form of conductors 98, 100. The coils of the electromagnets are by means of conductors 102, 104 connected to the positive pole of a source of current 106 the negative pole of which is connected to the relays 90 and 92 through a conductor 108 and branch conductors 110 and 112, respectively. The movable cores 114, 116 of the electromagnets are in the form of rods the outer ends of which are mounted on a pin 118 in the bifurcated end of a crank arm 120 which is secured to the upper end of a vertical shaft 122 mounted in a fixed thrust bearing 124. The lower end of the shaft 122 carries a swinging arm 126 which can move in a vertical plane about a pivot 128 and the outer end of which has a shaft 130 for an engagement roller 132. The swinging arm 126 is acted upon by a spring 134 which bears on an arm 136 fixed to the shaft 122 so as to keep the roller in yielding contact with the work 72. A spring 138 biases the arm 82 away from the edge 18 of the table.

If the work has happened to displace itself, for instance too far from the edges 18 of the table, the slide shoe 80 will take part in this movement and is maintained in yielding contact with the edge of the work by means of the spring 138. As a result thereof the arms 82, 88 will move the pin 91 into contact with the relay 92 so that a circuit will be closed from the positive pole of the source of current 106 via the conductor 104, the electromagnet 96, the conductor 100, the relay 92 and the conductors 112, 108 to the negative pole of the source of current. The core 116 will be drawn into the electromagnet 96 resulting in that the arm 120 by means of the shaft 122 will swing the arm 126 together with the roller 132 in the direction toward the edge 18 of the table 10. Due to the frictional engagement with the roller and the pressure exerted by the spring 134 the work 72 will take part in this movement and return to its correct position. The corresponding sequence of events will occur if the work has displaced itself too far toward the edge 18 of the table. Even in that case the seam will be caused to run at a constant distance from the edge of the work.

In case of large works where the required contact surface of the guide rollers or the engagement roller is greater than that of a single roller it is possible to use two rollers which are located in a common plane together with an endless band running around and between the rollers, the lower run of the band forming the engagement means for cooperation with the work.

What I claim is:

1. In a sewing machine having a work-supporting plate and a feed mechanism for feeding the work along the upper surface of said plate and a pressure foot from beneath which the work emerges with a line of stitching therein; the improvement comprising means for maintaining said line of stitching parallel to an edge of the work, said means comprising a pair of rollers whose axes are disposed at acute angles of opposite sense to said line of stitching, said rollers being individually engageable with the work to press the work against said surface thereby to shift the work transversely of the direction of said line of stitching, and means responsive to lateral deviation of the edge of the work from a predetermined position for selectively individually vertically reciprocating said rollers to engage said rollers with the work to shift the work laterally in a direction toward said predetermined position.

2. Apparatus as claimed in claim 1, said responsive means including a pair of photoelectric cells displaced from each other transversely of the line of stitching, and a light source above said cells, the edge of the work masking only one of said cells from said light source in said predetermined position.

3. In a sewing machine having a work-supporting

plate and a feed mechanism for feeding the work along the upper surface of said plate and a presser foot from beneath which the work emerges with a line of stitching therein; the improvement comprising means for maintaining said line of stitching parallel to an edge of the work, 5 said means comprising a roller that contacts the work to press the work against said surface with the axis of the roller at an angle to the line of stitching, and means responsive to lateral deviation of the edge of the work from a predetermined position for swinging said roller 10 in a horizontal plane under the influence of said responsive means thereby to alter the angle of said axis relative to the line of stitching so as to shift the work laterally in a direction toward said predetermined position.

4. Apparatus as claimed in claim 3, and means for continuously maintaining said roller in contact with the work.

References Cited

UNITED STATES PATENTS

2,290,123	7/1942	Wilfong	-----	112—203
2,979,745	4/1961	Schaefer et al.	----	112—211 X
3,013,513	12/1961	Judelson	-----	112—203
3,182,619	5/1965	Sally	-----	112—203

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