Oct. 9, 1951 P. LEVINE 2,570,695

WEB ALIGNING DEVICE

Filed March 21, 1947 3 Sheets-Sheet 1

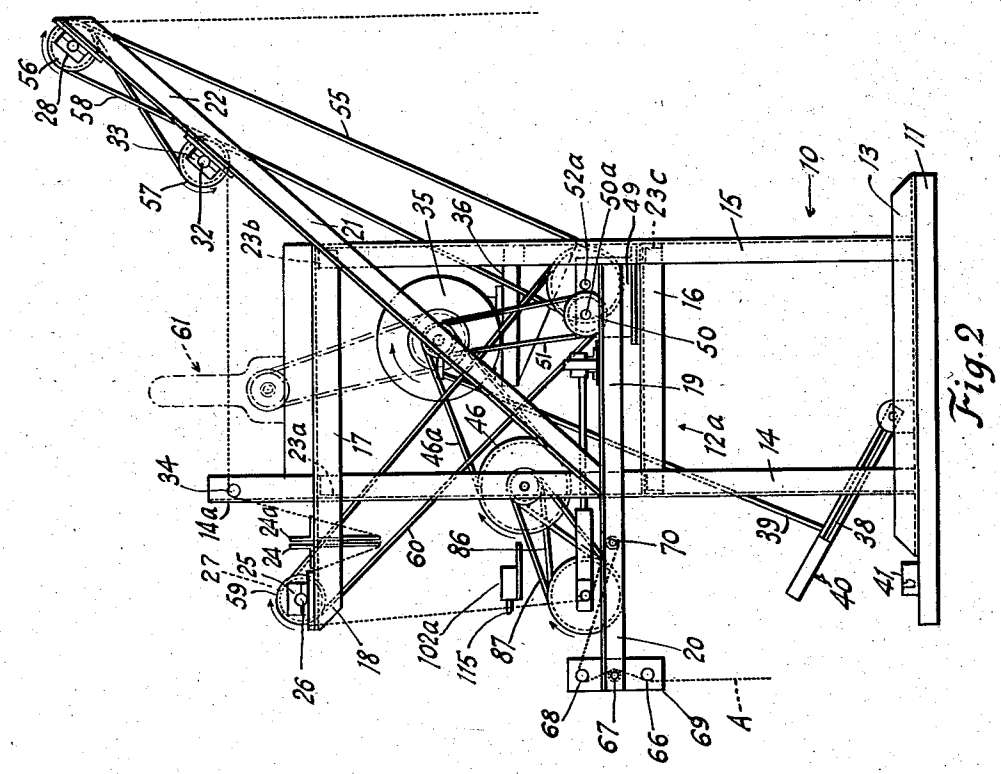


Fig. 2

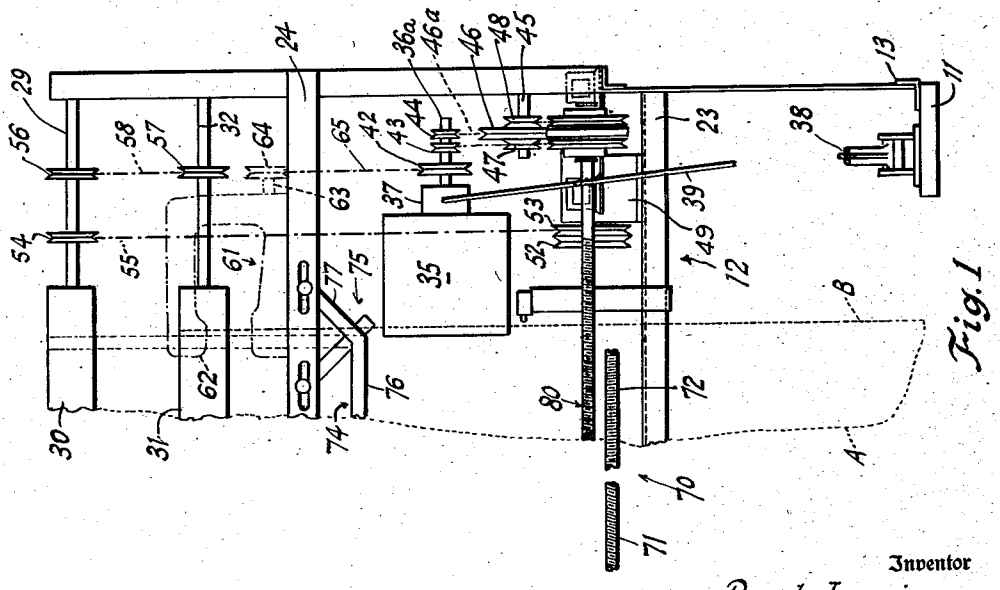


Fig. 1

Inventor
Paul Levine

By
J. B. Felshin
Attorney

Oct. 9, 1951 P. LEVINE 2,570,695

WEB ALIGNING DEVICE

Filed March 21, 1947 3 Sheets-Sheet 2

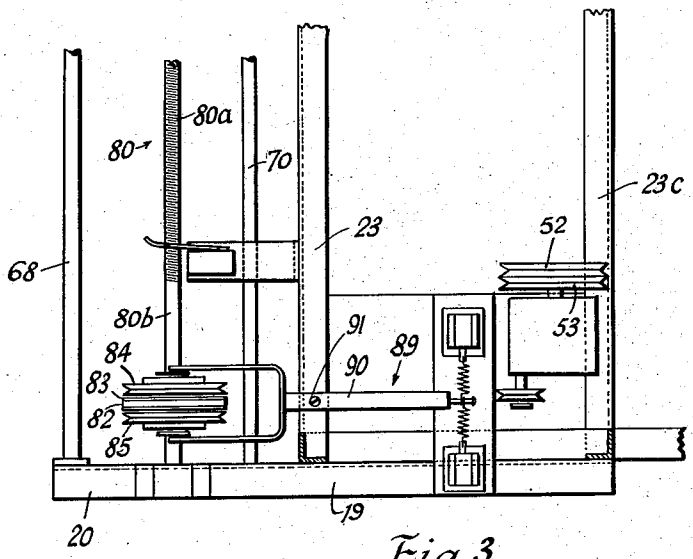


Fig. 3

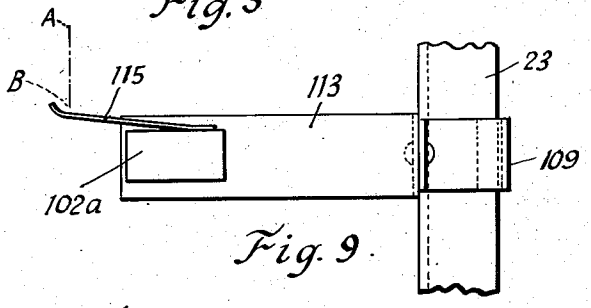


Fig. 9

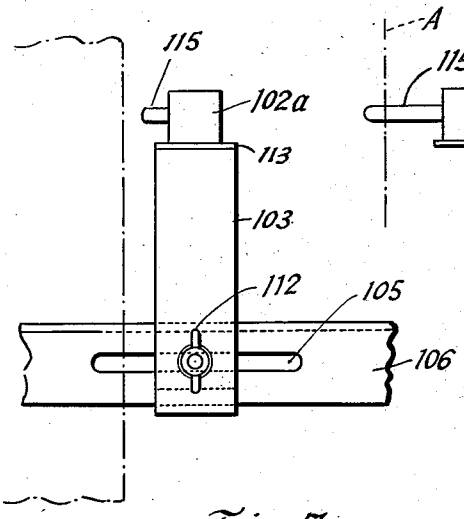


Fig. 7

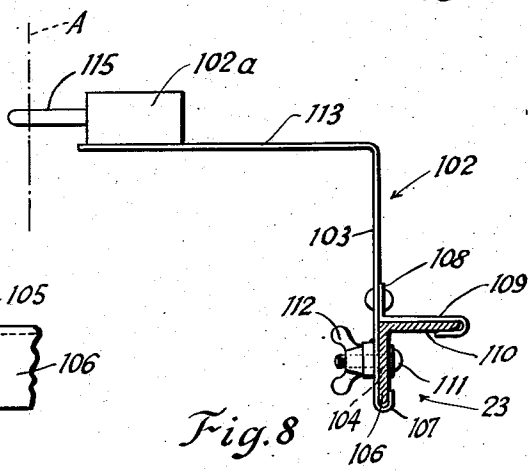


Fig. 8

Inventor

Paul Levine

By

J. B. Felsheim

Attorney

Oct. 9, 1951 P. LEVINE 2,570,695

WEB ALIGNING DEVICE

Filed March 21, 1947 3 Sheets-Sheet 3

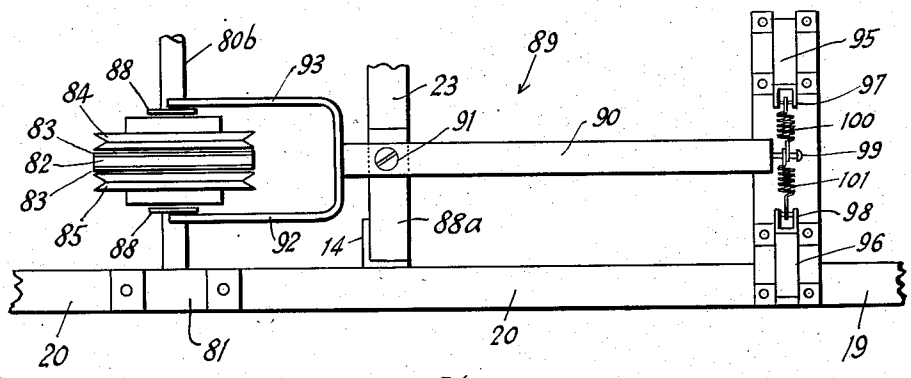


Fig. 4

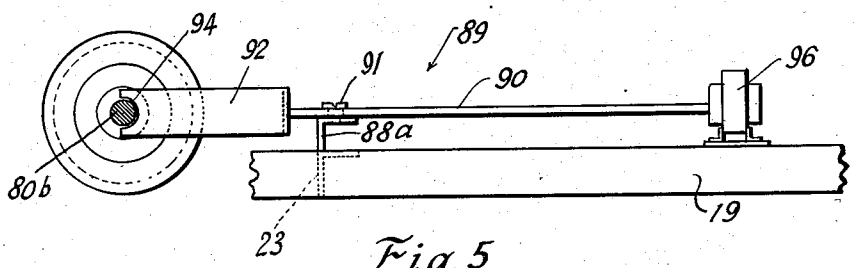


Fig. 5

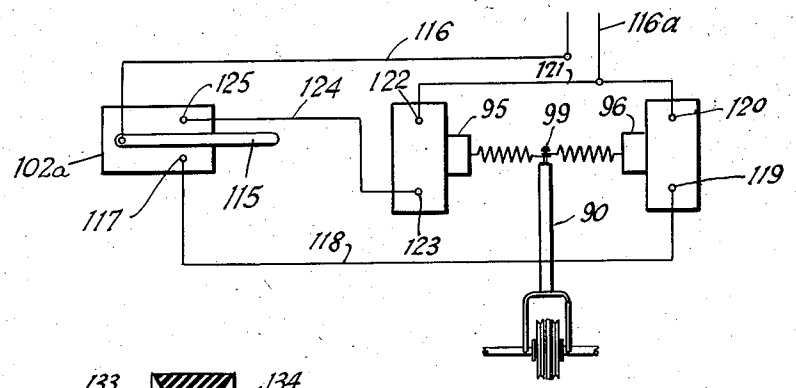


Fig. 6

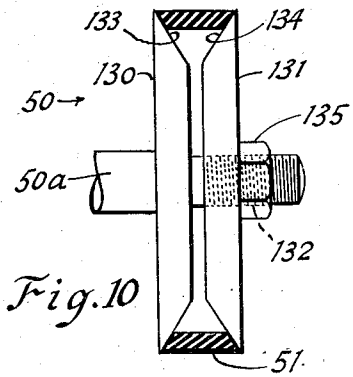


Fig. 10

Inventor

Paul Levine

By

J. B. Felshin

Attorney

Patented Oct. 9, 1951

2,570,695

UNITED STATES PATENT OFFICE

2,570,695

WEB ALIGNING DEVICE

Paul Levine, New York, N. Y., assignor of one-third to Hillel Levine, Brooklyn, and one-third to James Levine, Flushing, N. Y.

Application March 21, 1947, Serial No. 736,207

12 Claims. (Cl. 112—203)

1

This invention relates to a device for hemming the edge of a fabric. More particularly, the invention is concerned with a device which includes means for automatically aligning the edge of a web or fabric moving through the device, with respect to the stitching portion of the device, thereby producing a uniformly hemmed product.

An object of this invention is to provide a device which includes means for continuously feeding fabric to be hemmed, through the device, means for laterally shifting the moving fabric in either direction and means for automatically limiting the lateral shift of the fabric, thereby keeping the fabric in a predetermined path of travel.

A further object of this invention is to provide in a web-feeding device, automatic means for maintaining the edge of the web moving through the device in a predetermined path of travel wherein the said means comprises a lead screw rotatable in either direction and in engagement with the web and adapted to shift the web laterally in either direction and means including a switch actuated by contact with the edge of the laterally shifting web for determining the direction of rotation of the lead screw and limiting the shifting movement of the web.

Yet another object of this invention is to provide in a fabric or web hemming device the combination of a sewing means, a fabric edge aligning means, and fabric feeding means, each of said means being interconnected to a constant speed, unidirectional motor, together with means for varying the speed of the fabric feeding means and the length of stitch made by the sewing means.

Still a further object of this invention is to provide in a fabric hemming device, the combination of folding means for producing the hem in the fabric and switch actuated means for keeping the edge of the fabric in a predetermined path of travel during its passage through the device wherein the folding means and the position of the switch may be adjusted to produce hems of different widths.

Still another object of this invention is to provide an improved hemming device and web aligning means of the character described which is adapted for use in the hemming of webs as well as aligning longitudinally moving fabrics, which shall require a minimum amount of attention on the part of the operator, which shall be sure and positive in operation and yet practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and part hereinafter pointed out.

2

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts which will be exemplified in the construction hereinafter described, and of which the scope of application will be indicated in the following claims.

In the accompanying drawing, in which is shown various possible illustrative embodiments of this invention,

Fig. 1 is a front elevational view of the hemming device embodying the invention, with parts removed;

Fig. 2 is a side elevational view of the device shown in Fig. 1;

Fig. 3 is a top plan view of the rotatable means for laterally shifting fabric together with associated switch controlled means for reversing the direction of rotation of said rotatable means;

Fig. 4 is a top plan view of the details of the reversing means shown in Fig. 3;

Fig. 5 is a front elevational view of the means shown in Fig. 4;

Fig. 6 is a diagrammatic showing of the electrical circuit interconnecting the reversing means and switch means shown in Fig. 3;

Fig. 7 is a front elevational view of the switch means indicated in Fig. 3 and showing an adjustable support therefor;

Fig. 8 is a side elevational view of the switch means and support shown in Fig. 7;

Fig. 9 is a top plan view of the switch means and support shown in Fig. 7; and

Fig. 10 is a cross-sectional view of a variable diameter pulley which controls the speed of the feeding means of the device.

Referring now in detail to the drawing, 10 designates the hemming device embodying the invention. The same comprises a base 11 on which is mounted a frame structure 12 including an end frame 12a. The end frame 12a comprises a member 13 suitably secured to the base 11 and from either end of which extends a pair of aligned uprights 14, 15. The upright 14 includes a portion 14a extending above the end of upright 15. The uprights 14 and 15 are interconnected by a cross member 16 and a member 17 which includes an extension thereof 18 projecting outwardly of the upright 14. A member 19 also interconnects the uprights 14 and 15, being disposed between the cross member 16 and the member 17 and adjacent the cross member 16. The member 19 includes a projecting extension 20 disposed outwardly of upright 14. A member 21 is secured on the frame 12a, extending diagonally from the intersection of upright 14 and the mem-

ber 19, in an upward and outwardly inclined direction, to the intersection of upright 15 and member 17, and including a projecting portion 22 extending upwardly and outwardly thereof.

It is understood that the end frame 12a is duplicated at the other end of the base 11 and is in aligned, parallel relationship thereto. The end frames 12a are interconnected by an angle member 23 extending from the intersection of the upright 14 and cross member 16. Members 23a, 23b and 23c similar to the angle member 23 further interconnect the frames 12a at the intersection of uprights 14 and 15 with the member 17 and the intersection of the upright 15 with the cross member 16. A pair of spaced angle members 24, 24a interconnect the projecting portions 18 of the members 17. The members 24, 24a are formed with a pair of longitudinally spaced transverse slots for the purpose hereinafter described.

Means are provided for feeding fabric A through the device. To this end there is journalled on bearing blocks 25 suitably secured to the ends of projecting portions 18 of member 17, a shaft 26. A friction roller 27 covered with emery cloth, is secured to the shaft 26. Similarly, bearing blocks 28 are mounted on the ends of diagonal member 22, in which is journalled a shaft 29 to which is secured a felt covered roller 30. Also mounted on member 22 and in spaced relation to the roller 30, is a felt covered roller 31 which is secured to a shaft 32 journalled on bearing blocks 33. An idler roller 34 is suitably journalled on the upper ends of projection 14a of member 14, in horizontally aligned relationship to the roller 31.

A constant speed, unidirectional motor 35 is suitably secured to a motor mounting bracket 36 extending from upright 15, towards upright 14. The motor 35 comprises an output shaft 36a and a clutching device 37 for rotatably connecting the shaft to the motor. The clutching device 37 is actuated by a treadle member 38 pivotally mounted on the base 11 and interconnected to the clutch by a link 39. A hook 40 on the treadle member 38 may be disengageably connected to a latch 41 on the base 11, for continuous operation of the shaft 36a. Secured to the output shaft 36a of motor 35, is a pulley 42 and spaced therefrom, a pair of spaced, smaller pulleys 43, 44. Journalled on upright 14 and extending inwardly thereof, is a shaft 45. Secured to the shaft 45 is a large pulley 46 aligned with pulley 44 and interconnected thereto by belt 46a and flanked on either side thereof by a pair of smaller pulleys 47, 48.

A speed reducing gear box 49 is mounted on a suitable bracket extending from member 23c and comprises an input shaft 50a on which is secured a variable diameter pulley 50 aligned with pulley 43 on motor shaft 36 and interconnected thereto by a belt 51. The gear box 49 further comprises an output shaft 52a on which is secured a double pulley 52, 53. The pulley 53 is aligned with a pulley 54 secured on shaft 29 and interconnected thereto by a belt 55. A pulley 56 secured on shaft 29 in spaced relation to pulley 54, is in alignment with a pulley 57 secured on shaft 32 and interconnected thereto by a crossed belt 58. The pulley 52 is in alignment with a pulley 59 secured to shaft 26 and interconnected thereto by belt 60.

A sewing device 61 is suitably mounted between the members 23a and 23b. The sewing device 61 comprises a sewing head 62 which is disposed between the end portions of the idler roller 34 and the feed roller 31. The sewing device 61 further comprises an actuating shaft 63 on which is mounted a pulley 64. The pulley 64 is aligned with pulley 42 on motor shaft 36 and is interconnected thereto by belt 65.

The fabric A which is to be hemmed, is guided into the device 10 by means of a set of three spaced, vertically aligned rods 66, 67, 68, suitably mounted on brackets 69 secured to the ends of extension 20 of member 19. Means are also provided for stretching the fabric A laterally as it is received from the guide rod 68. To this end a scroll bar 70 is suitably journalled in the extension 20 of member 19 adjacent the upright 14. The scroll bar 70 comprises two portions 71, 72 threaded from either end, inwardly towards each other.

The fabric A is fed through the device 10 by means of the rollers 27, 34, 31 and 30. It will be apparent that the motor shaft 36a, rotating in a clockwise direction as indicated in Fig. 2 will also impart rotation in a similar direction through the speed reducing gear box 49 to the rollers 27 and 30 which frictionally engage the inner surface of the fabric A. The roller 31 which frictionally engages the outer surface of the fabric A is rotated in a counter clockwise direction by means of the crossed belt 58 connection to roller 30. As the fabric A passes between roller 27 and idler roller 34, an edge portion thereof is folded to produce the desired hem. To this end there is provided folding means 73 disposed between and below the rollers. The folding means comprises a pair of spaced members 74, 75 which extend downwardly from members 24, 24a respectively.

The folding members 74, 75 are formed with through openings which register with the transverse slots in the members 24, 24a respectively. Screws passing through the registering openings and slots together with wing nuts screwed thereon, permit adjustment of the position of the folding members 74, 75 as shown in Fig. 1, for the purpose hereinafter described. Member 74 comprises a bar having a horizontal edge 76 and intersecting therewith, an upwardly and outwardly inclined edge 77 extending at a predetermined angle to the edge 76. The member 75 is a rectangular shaped bar which extends from the member 24a in a downward and outwardly inclined direction, the lower edge thereof being in aligned relationship with the angular intersection of the edges 76, 77 of member 74.

Means are provided for keeping the edge B of the fabric A, as it moves through the device in aligned relationship to the sewing device 61. To this end there is provided a lead screw 80 which is journalled for either clockwise or counterclockwise rotation in bearing blocks 81 (Fig. 4) suitably mounted on the extension 20 of the member 19. The lead screw 80 is disposed between the guide bar 69 and the scroll bar 70 and comprises a central right hand threaded section 80a and an unthreaded end section 80b. Secured on the end portion 80b of the lead screw 80, spaced from the bearing block 81, is a clutch disc 82 which has leather facings 83 on either side thereof. Rotatably mounted on the lead screw 80 and disposed on either side of the clutch disc 82, are a pair of clutch pulleys 84, 85. The pulley 84 is aligned with pulley 47 on shaft 45 and interconnected thereto by a crossed belt 86. Pulley 85 is similarly aligned with pulley 48 on shaft 45 and interconnected thereto by a straight

belt 87. Also mounted on the lead screw 80 are thrust washers 88 on either side of the pulleys 84, 85.

A bracket 88a is secured to upright 14 and extends over angle member 23. Mounted on the bracket 88a is a pivoted bifurcated member 89. The same comprises an arm 90 pivotally mounted adjacent one end thereof on the member 88a by means of a pivot screw 91. Extending from the arm 90 towards the lead screw 80b is a pair of parallel arms 92, 93. The ends of the arms 92, 93 are formed with aligned semi-circular recesses 94 which accommodate the end portion 80b of lead screw 80.

Mounted on a bracket secured to the member 19, are a pair of solenoids 95, 96 having their armatures 97, 98 disposed in opposed relationship to each other and lying adjacent the other end of arm 90. The armatures 97, 98 are resiliently connected to a pin 99 extending from the end of arm 90 by means of coiled spring members 100, 101 respectively.

Slidably mounted on the angle member 23 for horizontal movement is a right angle bracket 102 on which is mounted a microswitch 102a for controlling the pivoted movement of bifurcated member 89. The bracket 102 comprises a vertical arm 103 formed with a through opening 104 which may be aligned with a transverse slot 105 formed in the vertical portion 106 of angle member 23. The arm 103 further comprises a turned edge portion 107 which accommodates the lower edge of the portion 106 of the member 23. The bracket 102 further comprises an angular member comprising a short arm portion 108 riveted to the vertical arm 103 and a long arm portion 109 overlying the horizontal portion 110 of the member 23 and having a turned end portion accommodating the outer edge of the horizontal portion 110 of the member 23. A headed screw 111 passing through the transverse slot 105 in the vertical portion 106 of member 23 and the opening 104 in the vertical arm 103 of bracket 102, and a wing nut 112, permits securing the bracket in a predetermined position. Extending outwardly from the upper end of the vertical arm 103 of the bracket is a horizontal arm 113. Mounted on the outer end of the arm 113 is the micro switch 102a which includes a contact switch arm 115 disposed over the lead screw 80, towards the feed roller 27.

In Fig. 6 is a diagrammatic showing of the electrical circuit interconnecting the microswitch 102a with the solenoids 95, 96 which impart pivoted movement to the member 89. One power lead 116 is connected to switch arm 115. One of the switch contacts 117 on the microswitch 102a is connected by lead 118 to one of the terminals 119 on the solenoid 96. The other terminal 120 on the solenoid 96 is connected by lead 121 to one of the terminals 122 of the solenoid 95. The other terminal 123 on the solenoid 95 is connected by lead 124 to the other switch contact 124 on the microswitch 102a. The lead 121 is interconnected to the other power lead 116a.

In the operation of the device 10, the motor 35 is clutched to the shaft 36a by means of the treadle actuated clutch 37. The rotation of the shaft 36a in a clockwise direction will impart similar rotation to the input pulley 50 of the speed reduction means 49 and the output pulleys 52, 53 thereof, which in turn will impart clockwise rotation to the interconnected connected rollers 27 and 30. The roller 31 will rotate in a counter-clockwise direction due to the twisted belt connection to the roller 30. The fabric or web A is introduced into the device by being passed over and under the guide rods 66, 67, 68 as shown in Fig. 2. The fabric then passes rearwardly, around the scroll bar 70 which stretches the fabric laterally. The stretched fabric is then brought forward and passes into engagement with the threaded portion 80a of the screw 80, moving upwardly towards the frictional feed roller 27. The screw thread portion 80a on the lead screw 80 in contact with the fabric is adapted to move the fabric A laterally either to the right or the left, depending on the direction of rotation of the lead screw. When the screw 80 rotates in a counter-clockwise direction, the fabric A will move to the right looking at Fig. 1. With clockwise rotation of the lead screw 80 the fabric will move to the left.

The micro-switch 102a together with its supporting bracket 102 is positioned in a manner to properly align the edge portion B of fabric A with respect to the sewing device 62. The positioning of the micro-switch takes into account the folding of the fabric edge to produce a hem of desired width by means of the folding device 75 which may also be adjustably positioned relative to a stitching line coincident with the stitching means 62 and which is disposed between the feed roller 27 and the sewing device 62. The bracket 102 is accordingly positioned so that the switch arm 115 on the micro-switch 102a in its normal position, will define a path of travel of the fabric A, properly aligning the edge thereof. In such a position, the switch arm 115 will be in contact with the switch contact 125 on the micro-switch. In such a position, the solenoid 95 will be energized through leads 116, 124, 121 and 116a. The energized solenoid 95 will move the arm 90 about its pivot pin 91 in a counter-clockwise direction. The pivoted movement of the arm 90 will have the effect of moving the rotating pulley 84 axially into frictional contact with the clutch disc 82. Since the pulley 84 rotates in a counter-clockwise direction, the disc 82 will also move in the same direction thereby rotating the lead screw in a counter-clockwise direction. As a result, the fabric A will move laterally to the right, as viewed in Fig. 1, until it moves the switch arm 115 is moved outwardly of its normal position, it makes contact with the switch contact 117 on the microswitch which will energize the solenoid 96 through leads 116, 118, 121 and 116a. The energized solenoid 96 will then move the arm 90 about its pivot pin 91 in a clockwise direction. This will have the effect of bringing the arm 93 into contact with the rotating pulley 85 and moving it axially into contact with the friction disc 82. Since the pulley 84 rotates in a clockwise direction the lead screw 80 will also rotate in a clockwise direction, which will move the fabric A laterally to the left, as viewed in Fig. 1. This movement will continue until the switch arm 115 is restored to its normal position by the movement of the fabric edge B out of contact therewith. Accordingly, the switch arm 115 is effective in reversing the lateral shift of the fabric A within small limits, thereby maintaining the edge of the fabric A in a predetermined path of travel, correctly aligned with the sewing means 61. It is understood, that a change in the width of the hem to be made in the fabric A will require repositioning the bracket 102 in order to properly position the switch arm 115 of the switch 102a. Also, the position of the folding means 73 may be adjusted to properly

fold the edge of the fabric to produce the desired hem width.

When the fabric A passes beyond the feed roller 27, the edge thereof is received between the members 74, 75 of the folding means 73 for producing the desired folded edge. The fabric A passes downwardly around the horizontal edge 76 of the member 74 with an edge portion of the fabric passing around the inclined edge 77. The angularly folded edge portion of the fabric thus produced then passes around the lower edge of the inclined folding member 75, thereby producing a second angular fold equal to the first angular fold. The free edge B of the fabric is thus turned inwardly over the body of the fabric A to produce the desired hem, the hemmed fabric continuing its movement upwardly towards the idler roller 34.

The fabric A with its folded hem portion moves from roller 34 horizontally towards the rear of the device and passes through the sewing device 61 where the hem is stitched. The hemmed fabric then passes into contact with the successive rollers 31 and 30 which frictionally draw the fabric through the device.

It will be noted that the sewing device 61 is directly connected to the constant speed motor 35 by belt 65. In the event that the length of the stitch made by the sewing device 61 is to be changed, the feeding speed of the cloth is varied to produce the desired stitch. To this end, the variable diameter pulley 50 on the speed reducing gear box 49 may be adjusted to regulate the speed of the feed rollers 27, 30 and 31 interconnected to the speed reducing gear box. The variable diameter pulley 50 comprises a pair of opposed discs 130, 131 keyed on a reduced, threaded end portion 132 of the input shaft 50*a*. The discs 130, 131 are formed on their inner peripheral portions with edges 133, 134 inclined towards each other. A nut 135 engaging the threaded portion 132 of the shaft 50*a* and bearing against the disc 131, is adapted to determine the axial position of the disc 131 with respect to disc 130. In this manner the effective diameter of the pulley 50 with respect to the belt 51 may be varied, thereby regulating the speed of the output pulleys 52, 53 which in turn determine the speed of the feed roller 27, 30 and 31.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention I claim as new and desire to secure by Letters Patent:

1. In combination, means to feed a flexible web longitudinally, a threaded member adapted to engage said web, said threaded member being rotatable in either direction whereby rotation of said threaded member in one direction will shift the web sideways in one direction, and reverse rotation of said threaded member will shift the web sideways in an opposite direction, means to selectively rotate said threaded member in opposite directions, a switch adapted to contact an edge of the web, and means controlled by said switch to operate said rotating means.

2. In combination, means to feed a flexible web longitudinally, a threaded member adapted to engage said web, said threaded member being rotatable in either direction whereby rotation of said threaded member in one direction will shift the web sideways in one direction, and reverse rotation of said threaded member will shift the web sideways in an opposite direction, means to selectively rotate said threaded member in opposite directions, a switch adapted to contact an edge of the web, and means controlled by said switch to operate said rotating means, said rotating means including clutch means an unidirectional motor, and means connected to said motor to rotate said clutch means.

3. In a hemming device, the combination of means for feeding a web, means for folding an edge of the web, means for securing the folded edge of the web and means for aligning the edge of the web with respect to said securing means said aligning means comprising a member engaging said moving web and being rotatable in either direction and having means to shift said web laterally in either direction depending upon the direction of rotation and means including a switch responsive to contact with an edge of the web, for determining the direction of rotation of said rotatable member.

4. In combination frictional feed rollers for feeding a web, a threaded member rotatable in either direction and adapted to engage said moving web for positioning the moving web relative to said feed rollers means for reversing the direction of rotation of said threaded member and switch means responsive to the contact of the edge of said web for controlling said reversing means.

5. In combination, means for moving a web, longitudinally, a threaded member rotatable in either direction adapted to engage said moving web and to shift said web laterally in either directtion depending upon the direction of rotation of said member, clutch means controlling the direction of rotation of said threaded member, and switch means responsive to the contact of the edge of said moving web, for controlling said clutch means.

6. In combination, frictional means for continuously feeding a web longitudinally, rotatable means adapted to engage a surface of said moving web for shifting said fabric laterally in either direction, clutch means for selectively rotating said fabric shifting means in either direction, solenoid means for actuating said clutch means and a switch interconnected to said solenoid means responsive to the contact of the edge of said shifting web for controlling said solenoid means.

7. In a hemming device, the combination of means for feeding a web, means for folding an edge of the web, means for securing the folded edge of the web and means for aligning the edge of the web with respect to said securing means said aligning means comprising a member engaging a surface of said moving web and being rotatable in either direction depending upon the direction of rotation and means including a switch responsive to contact with an edge of the web, for determining the direction of rotation of said rotatable member said folding means and said switch means being adjustably positioned with respect to said securing means.

8. In combination frictional feed rollers for feeding a web, a threaded member rotatable in either direction and adapted to engage said moving web means for reversing the direction of rotation of said threaded member and switch means

responsive to the contact of the edge of said web for controlling said reversing means said threaded member having a friction disc thereon, said reversing means comprising a pair of oppositely rotatable members selectively engageable with said friction disc, a pivoted member having portions thereof selectively engageable with said oppositely rotating members, and a pair of solenoid means connected to said pivoted member and interconnected to said switch means.

9. In a fabric hemming device comprising web feeding rollers, folding means for continuously forming a hem in the moving web and sewing means for continuously securing the hemmed portion of the moving web, means for continuously aligning the edge of said moving web with respect to said sewing means, said aligning means comprising a rotatable lead screw adapted to engage said moving web, means for selectively rotating said lead screw, in a clockwise or counter-clockwise direction, means for determining the direction of rotation of said lead screw, said determining means comprising a switch responsive to the relative position of the edge of the moving web for selectively actuating said rotating means in one direction or the other.

10. In combination, means to feed a fabric web, means to hem an edge of said web, means to stitch said hem, and means to shift said web toward alignment of a predetermined hem stitching line with the stitching means automatically upon said web shifting and moving said line, away from said stitching means, a single unidirectional electric motor, means connected to said motor for operating said feeding means and stitching means, said shifting means including a rotary bar adapted to engage said web and being formed with a helical groove, a reversing clutch interposed between said motor and said rotary bar, a switch adapted to be contacted by an edge of said web and means controlled by said switch for operating said reversing clutch.

11. In combination, means to feed a fabric web, means to hem an edge of said web, means to stitch said hem, and means to shift said web toward alignment of a predetermined hem stitching line with the stitching means automatically upon said web shifting and moving said line, away from said stitching means, a single unidirectional electric motor, means connected to said motor for operating said feeding means and stitching means, said shifting means including a rotary bar adapted to engage said web and being formed with a helical groove, a reversing clutch interposed between said motor and said rotary bar, a switch adapted to be contacted by an edge of said web and means controlled by said switch for operating said reversing clutch and means varying the speed of the feeding means without varying the speed of operation of the stitching means.

12. In combination, means to feed a fabric web, means to hem an edge of said web, means to stitch said hem, and means to shift said web toward alignment of a predetermined hem stitching line with the stitching means automatically upon said web shifting and moving said line, away from said stitching means, a single unidirectional electric motor, means connected to said motor for operating said feeding means and stitching means, said shifting means including a rotary bar adapted to engage said web and being formed with a helical groove, a reversing clutch interposed between said motor and said rotary bar, a switch adapted to be contacted by an edge of said web and means controlled by said switch for operating said reversing clutch and means varying the speed of the feeding means without varying the speed of operation of the stitching means and means to adjust the positions of the switch means and hemming means to permit varying of the width of the hem and to permit adjustment of the web relative to the stitching means.

PAUL LEVINE.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,186,906	Hopkins	June 13, 1916
1,468,809	Hermann	Sept. 25, 1923
1,478,075	Webster	Dec. 18, 1923
1,957,122	Wood	May 1, 1934
2,108,232	Nash	Feb. 15, 1938
2,229,647	Gardner et al.	Jan. 28, 1941
2,289,796	Meyer	July 14, 1942