

[54] AUTOMATIC PLEATING DEVICE

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[51] Int. Cl.² B65G 15/16

[58] Field of Search 198/165, 208, 190; 270/86,
270/93

[56] References Cited

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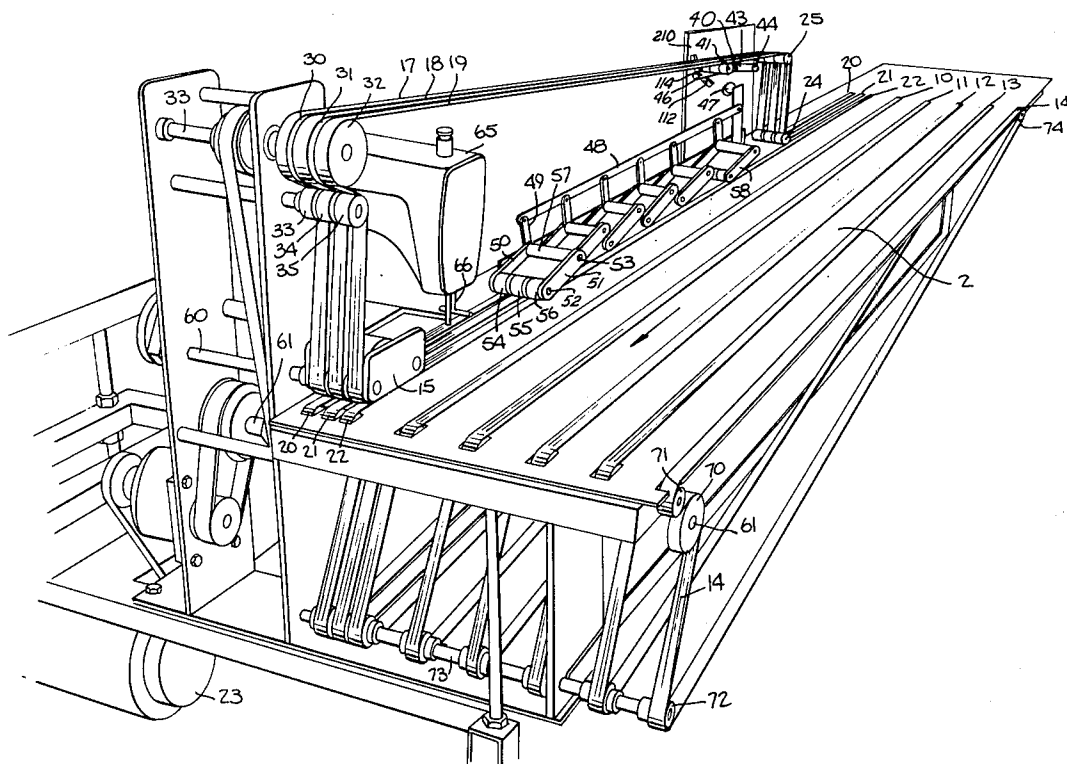
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[57]

ABSTRACT

This invention relates to an automatic apparatus for conveying fabric, such as a shirt front and forming it into a so-called "one-piece" or "cut-on" center pleat. It involves a plurality of upper hem belts and a plurality of lower hem belts for gripping and conveying the edge of the fabric through a folder to a sewing machine. Means are provided for adjusting the tension of those upper and lower hem belts.

8 Claims, 9 Drawing Figures



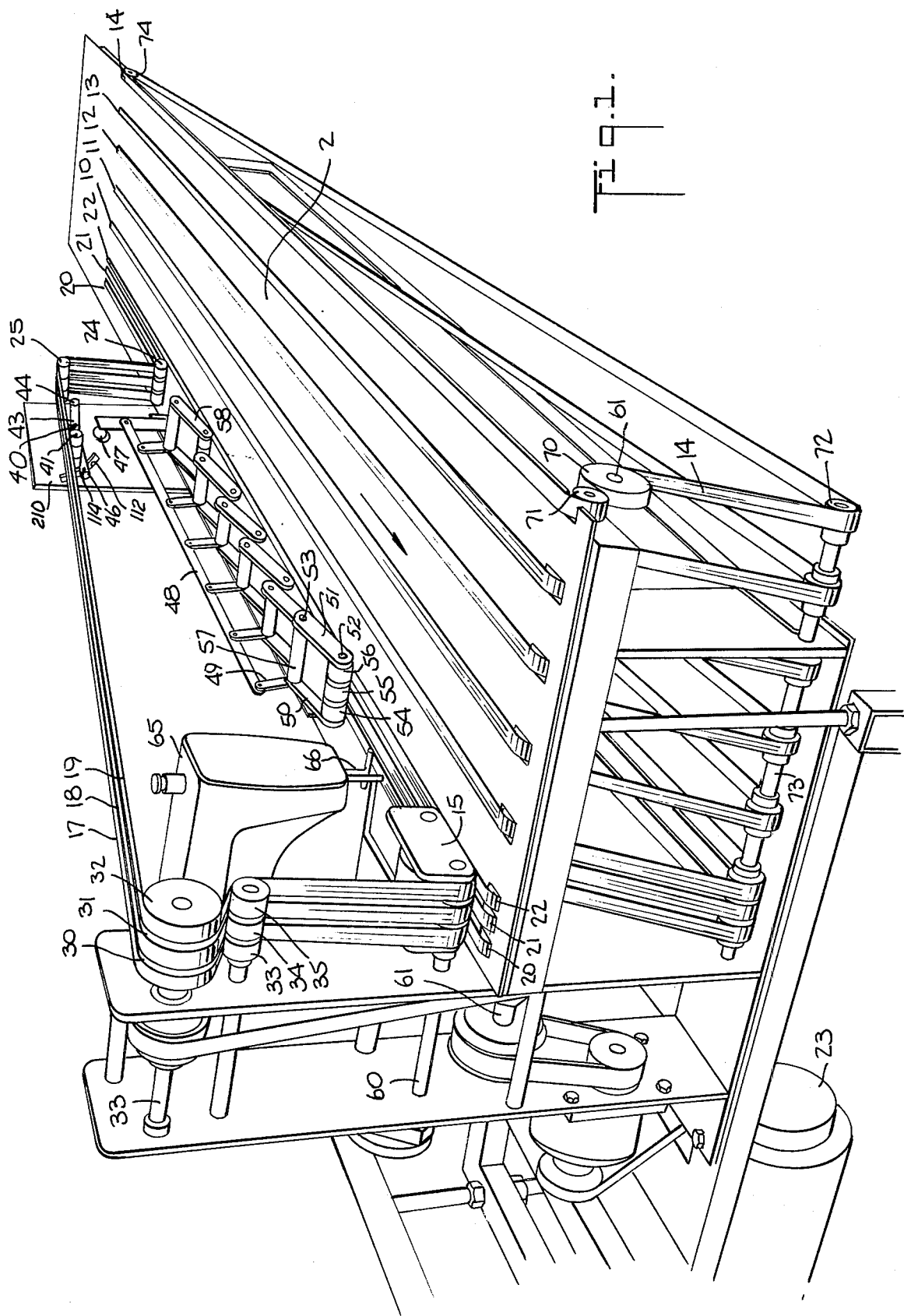
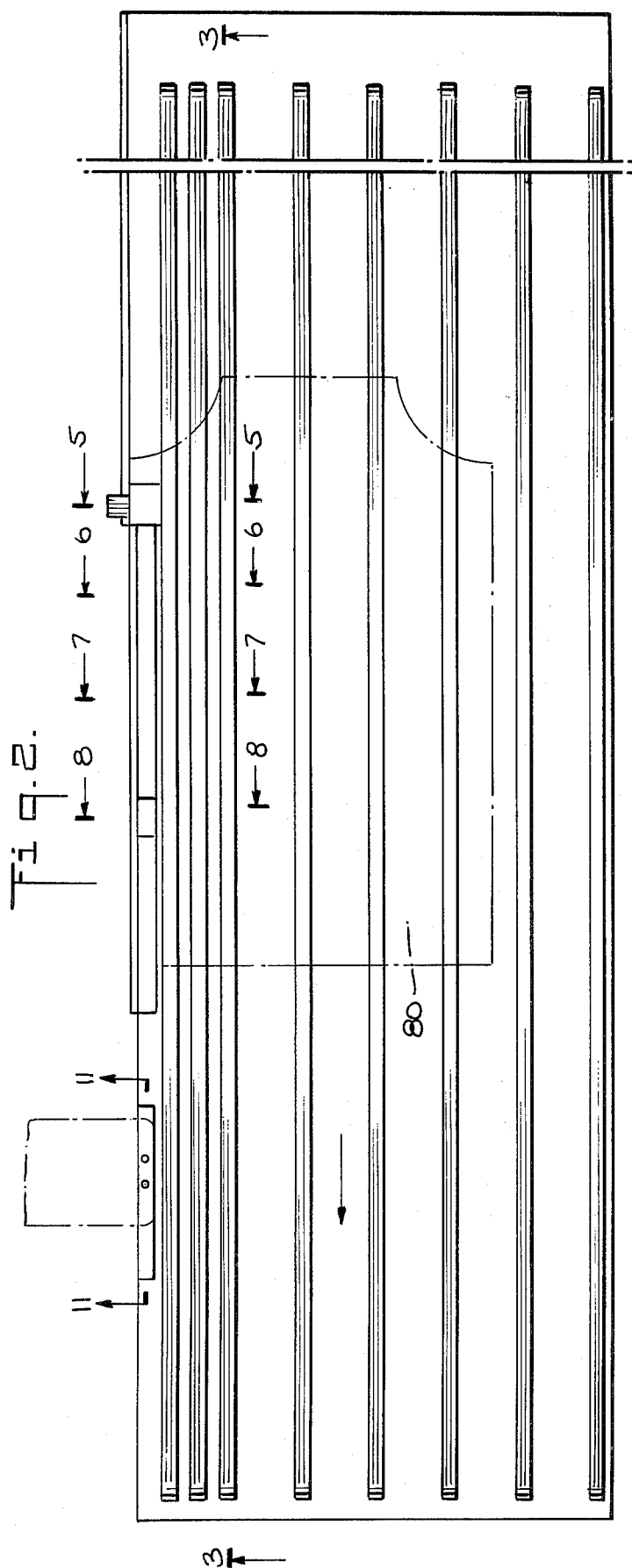
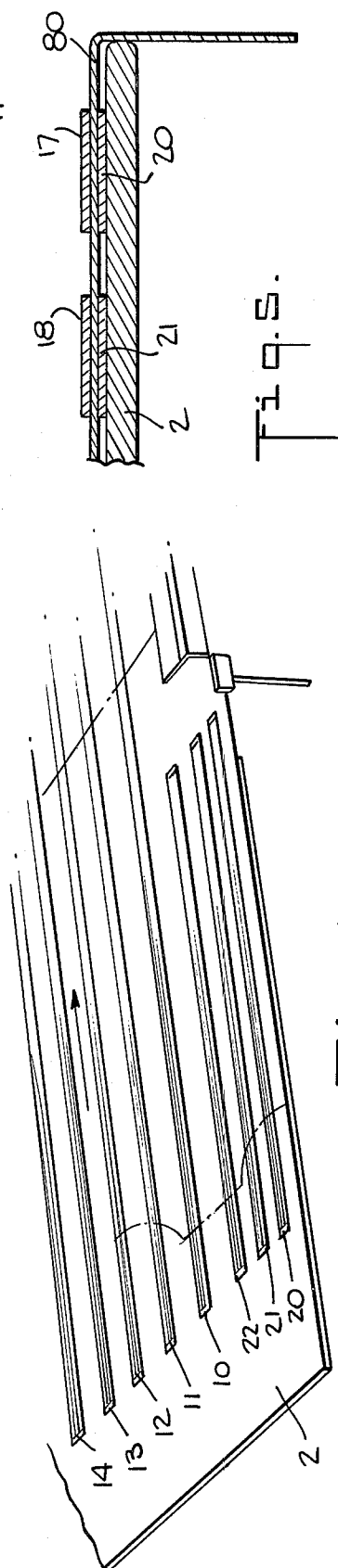
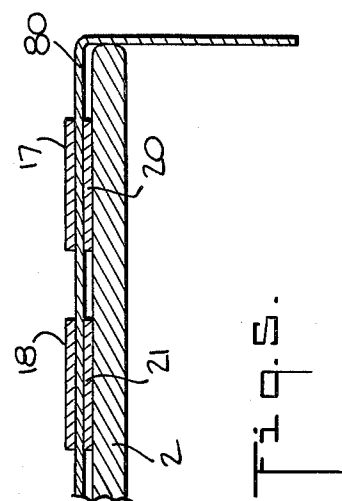
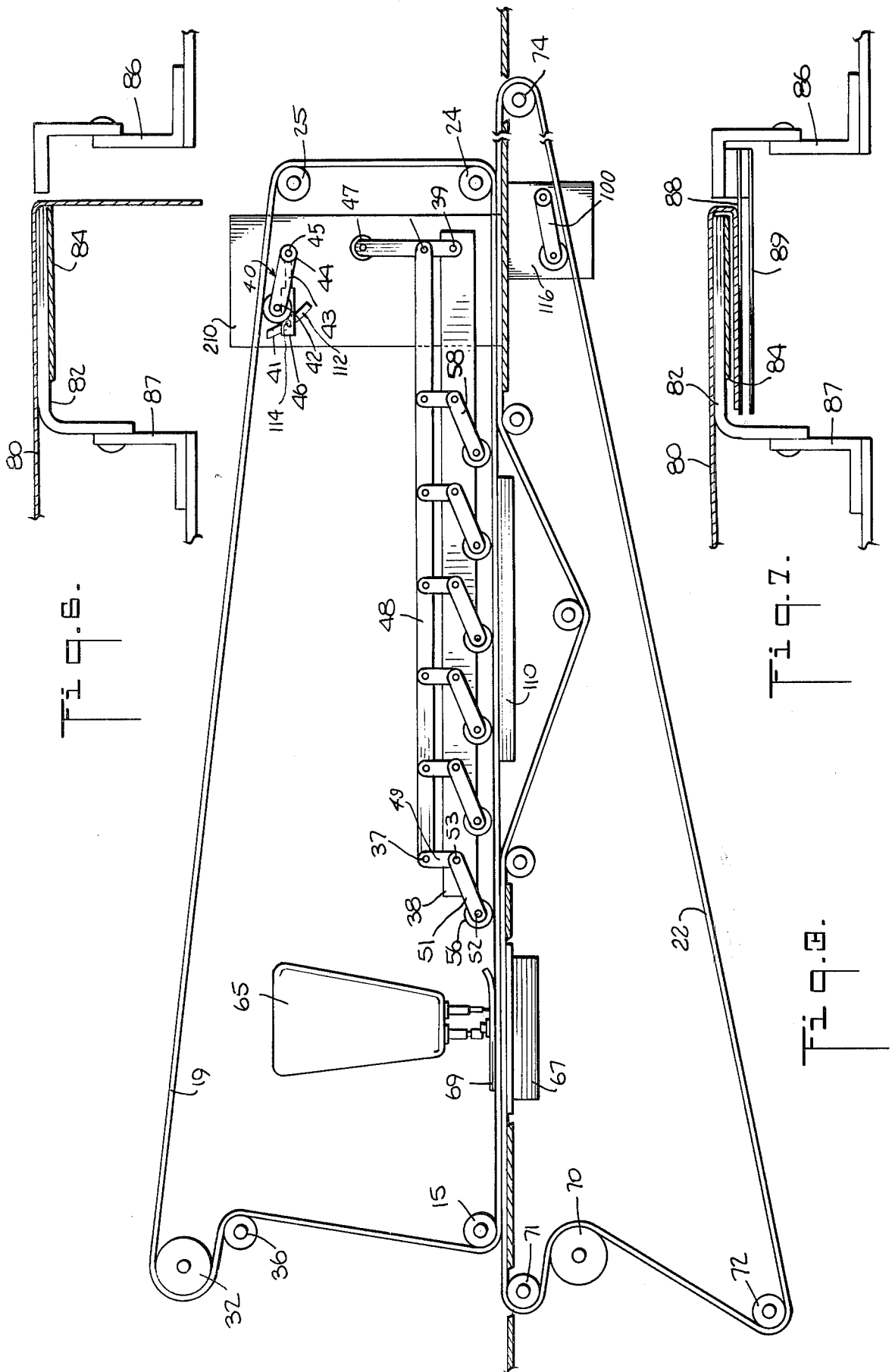


Fig. 1.





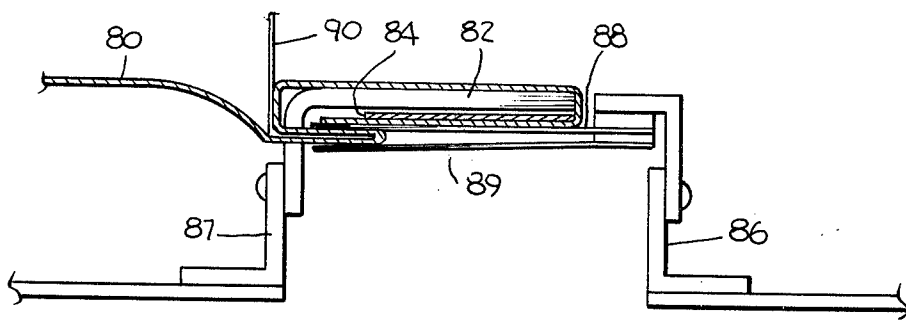


Fig. 8.

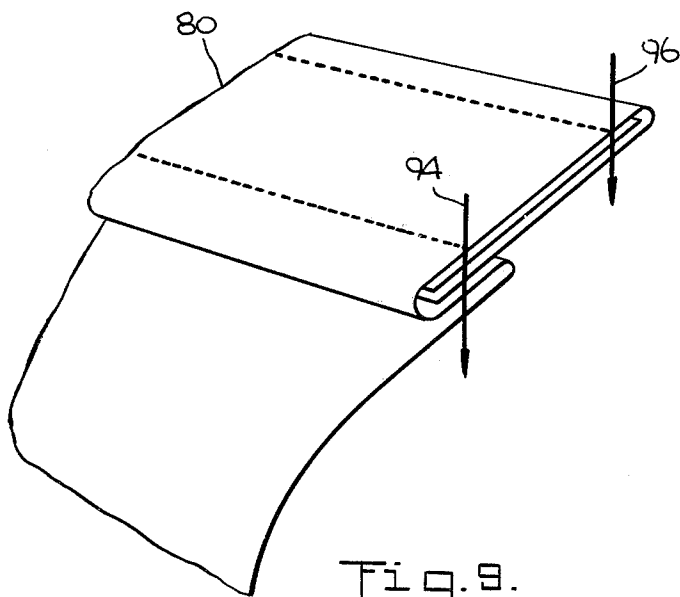


Fig. 9.

AUTOMATIC PLEATING DEVICE

BACKGROUND

Previously, pleats in fabrics, such as shirt fronts, have been formed by sewing machine operators using folding devices to form the pleat, which is then stitched on the sewing machine.

This invention provides an automatic device for performing the same functions. An operator is required only to feed fabric to the device and remove the pleated fabric. Because it is automatic, it is faster in operation than an operation involving a machine operator. It also provides a pleat which is better aligned and is free of distortion and pucker. The device of this invention may be used on a wide variety of fabrics including woven, non-woven and knit fabrics to produce rapidly and with those advantages a so-called "one-piece" or "cut-on" center pleat of the type shown in FIG. 9 of the drawings.

SUMMARY OF THE INVENTION

This invention is an automatic device for conveying fabric, woven, non-woven, knit or other types, such as a shirt front, and forming it readily into a so-called "one-piece" or "cut-on" center pleat of the type shown in FIG. 9 of the drawings. The device of this invention, in addition to being useful for a number of different types of fabrics, is readily used for fabrics of different thicknesses and to produce pleats having various widths and concomitant filler strips in those pleats. Use of the device permits the automatic production with great rapidity of a center pleat which is free of pucker and other distortion. In addition, as stated, the pleat may be of a selected width. Also it provides a means for aligning the pleat, which may contain a stripe of a shirt front, for example, with the other portion of the garment being produced.

The device of this invention comprises support means, a table mounted on those means, a plurality of endless conveyor belts travelling on the top, of and under the table, a plurality of endless lower hem belts (each being preferably of the same length) at one side of the table, and travelling on top of and under the table in the same direction as the conveyor belts, and upper endless hem belts (preferably of identical length to each other) disposed above the lower hem belts and travelling in the same direction. Means are provided for adjusting simultaneously the tension on all of the lower hem belts and means are provided for adjusting simultaneously the tension on all of the upper hem belts. In addition, means are provided for individually adjusting the tension on each of the upper and lower hem belts. Preferably, a series of roll assemblies are provided which bear on the upper hem belts as they pass over the lower hem belts and table and serve to control the fabric between the upper and lower hem belts.

In operation an operator places fabrics such as a shirt front on the table and conveyor belts. The shirt front resting on the conveyor belts is conveyed forward. At its edge the fabric is gripped between the upper and lower hem belts. The shirt front is passed through a conventional folding device to form the center pleat. Thereafter, the pleat is stitched on a sewing machine by a plurality of needles (which may be switched on and off in operation either manually or automatically).

The use of a plurality of upper and lower hem belts (and preferably those roll assemblies) provides positive control over the edge of the fabric so that puckering and other distortions are eliminated as the fabric is carried through the folding and sewing operation. The use of a plurality of lower hem belts also permits the pleat to be aligned with the other portion of the shirt stripe, for example, in the shirt front on one of the lower hem belts removed from the outer edge of the table. For example, if three lower hem belts are used, which is preferred, the center lower hem belt may be used for the purpose of alignment. By aligning a stripe of a shirt front on the center lower hem belt, the need for great accuracy in the prior cutting of the edge may be eliminated. Thus, the edge of a shirt front may extend beyond the edge of the table (rather than being aligned with an edge guide as in a conventional operation), the shirt front aligned on the center lower hem belt and the excess of the edge of the fabric cut prior to the folding operation. By having lower hem belts of the same length to each other and by having the upper hem belts of the same length to each other, their speeds can essentially be set the same. Another feature of the invention is means for adjusting tension simultaneously on the lower hem belts and means for adjusting tension simultaneously on the upper hem belts. Also, preferably, provided are individual means for adjusting tension on any of the upper and lower hem belts. The plurality of lower hem belts can thereby be accurately adjusted to travel at the same speed in relation to each other. The speed of the upper hem belts may thus also be adjusted to be the same to each other and the speed of the plurality of lower hem belts may be adjusted to be the same as the speed of the upper hem belts. These features of the invention permit the shirt front to be readily formed into a pleat and sewn without pucker or other distortion in it. As stated, the invention also permits alignment of the pleat during formation. Use of the invention also permits a speed of production significantly greater than an operation in which an operator forms a pleat, as previously, through the use of a folder fed by an operator.

Description herein of the invention to produce a pleat in a shirt front is illustrative, and the invention may be used to form a "one-piece" pleat in any fabric.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the apparatus of this invention.

FIG. 2 is a top view of the apparatus of FIG. 1.

FIG. 3 is a sectional side view of the apparatus of FIG. 1.

FIG. 4 is a partial side perspective view of the apparatus of FIG. 1.

FIG. 5 is a partial view taken along line 505 of FIG. 2.

FIG. 6 is a partial sectional view taken along line 6—6 of FIG. 2 and

FIG. 7 is a partial sectional view taken along line 7—7 of FIG. 2.

FIG. 8 is a partial sectional view along line 8—8 of FIG. 2.

FIG. 9 shows the "one-piece" pleat formed by using this invention.

DETAILED DESCRIPTION OF THE INVENTION

The following is a description of a preferred embodi-

ment of the invention. Referring to FIG. 1, the apparatus of this invention comprises support means generally shown as 1 in FIG. 1. A table 2 is mounted on the support means 1. A series of endless belts 10, 11, 12, 13 and 14 move on the top of table 2 in the direction of the arrow in FIG. 1. Belts 10, 11, 12, 13 and 14 are driven by motor 23 through a series of conventional wheels and belts. Motor 23 drives shaft 61 which is connected to a number of identical drive wheels. One of these drive wheels, shown as 70 in FIG. 1, drives belt 14. Associated with the drive roll 70 is an idle roll 71 just below the top of table 2. Belt 14 returns to the other end of the table by passing around another idle roll 72 mounted on shaft 73. At the other end of table 2 are similar idle rolls. Belt 14 passes around one of these which is shown as 74 in FIG. 1. Each of the other belts, 10, 11, 12 and 13 are similarly driven and endlessly transported around table 2.

Fabric such as a shirt, when laid upon belts 10 through 14, is carried in the direction of the arrow shown in FIG. 1. At the left of the table 2 in FIG. 1 are two other series of endless belts similar to 10 through 14. One of these series of endless belts, upper hem belts 17, 18 and 19, is also driven by motor 23 through conventional means. The power of motor 23 is ultimately taken off at shaft 33, to which is fixed drive wheels 30, 31 and 32 which drive the upper hem belts 17, 18 and 19. Associated with the drive rolls 30, 31 and 32 are idle rolls 34, 35 and 36 as shown in FIG. 1. Upper hem belts 17, 18 and 19 carry the hem of the fabric between them and lower hem belts 20, 21 and 22 from the front end of table 2 to sewing head 65. Upper hem belts 17, 18 and 19 at the front end of table 2 pass around idle roll assembly 24 and under a series of idle roll assemblies, including idle roll assembly 58 and idle roll assembly 49-57. From there upper hem belts 17, 18 and 19 pass below sewing head 65 to idle roll assembly 15. From there upper hem belts 17, 18 and 19 pass upwardly around idle rolls 34, 35 and 36 to drive rolls 30, 31 and 32. Upper hem belts 17, 18 and 19 then return unsupported over upper roll assembly 40 around idle roll assembly 25 and downwardly to idle roll assembly 24. Idle roll assemblies 24 and 25 are similar to idle roll assembly 34, 35 and 36 and are supported by means not shown.

Bearing on the upper hem belts 17, 18 and 19 are a series of idle roll assemblies which bear on the belts by gravity and are free to move a small distance vertically. They are described by reference to the roll assembly 49-57 nearest sewing head 65 shown in FIG. 1. That assembly consists of side bar 51 which is free to rotate about pivot pin 53. Pin 53 is fixed to stationary bar 38 (FIG. 3). Vertical bar 49 is integrally fixed to side bar 50 and side bar 50 is free to rotate about pivot pin 53. Side bars 50 and 51 are spaced apart on pin 53 by sleeve 57. Side bars 50 and 51 are connected by pin 52 are also spaced apart by rollers 54, 55 and 56 each of which are mounted on bushings (not shown) which are slightly wider than the roller. The bushings are free to rotate on pin 52 which is free to rotate in side bars 50 and 51. Pin 52 extends a few thousandths of an inch beyond side bars 50 and 51, and pin 53 also extends a few thousandths of an inch beyond side bar 51. At each end of pin 52, and at the end of pin 53 where it passes through side bar 51, a collar, slightly larger than the diameter of the pins, is fixed to prevent passage of the pins through the side bars. Between bar 38 and side bar

50 a collar (not shown) is attached to pin 53 a few thousandths of an inch from side bar 50. Pin 53, as stated, is fixed to bar 38. Pins 52 and 53 are a few thousandths of an inch in diameter smaller than the holes through which they pass in side bars 50 and 51. Those tolerances permit pin 52 and rollers 54, 55 and 56 as an assembly to rotate slightly and also to move slightly upwardly.

Vertical bar 49 is loosely connected to horizontal bar 48 by pivot pin 37 which is on the order of 0.03 of an inch smaller than the hole through which it is rotatably connected to bar 48. This loose connection permits roll assembly 54, 55 and 56 (and each other roll assembly) to move upwardly independent of the other roll assemblies by permitting vertical bar 49 to move to the right and pin 52 carrying those rolls to move upwardly by pivoting on pin 53 which is fixed to bar 38 attached to the frame of the apparatus. This permits the apparatus of this invention to accommodate different thicknesses of fabric and is important on start up and shut down of it. In addition the tolerances referred to before in relation to pins 52 and 53 also permit rolls 54, 55 and 56 to move upwardly slightly and to rotate slightly to accommodate variations in fabric thicknesses.

All of the roll assemblies may be lifted by moving handle 47 to the right (FIG. 3) which is connected by pivot pin 68 to horizontal bar 48, and pivots on pin 39 connected to plate 38. While those roll assemblies automatically accommodate, as previously described, to varying fabric thicknesses upon start up of the apparatus of this invention, it may at times be necessary for the operator to shut down the apparatus and all of the roll assemblies if a hem becomes stuck, for example, in the folder 110.

The middle idle roll assemblies (those other than assembly 49-57 and assembly 58) have only two rolls, one above belt 17 and one above belt 18, in the area above folder 110 (FIG. 3). A roll above belt 19 is omitted in this area, as table 2 is cut out there and it is not desirable to have a roll bearing on unsupported belt 19 in this area.

Upper roll assembly 40 (supported by member 210 upstanding from the table 2), over which belts 17, 18 and 19 pass, is used to adjust the tension on those belts. That roll assembly consists of rolls described by reference to one of them, roll 41. Roll 41 is rotatably mounted, through pin 42, on side bar 43. Lower sleeve 44 is mounted on side bar 43 and rotatably mounted on pin 45 that is rotatably supported by member 210. That roll assembly may be moved up or down to increase or decrease the tension on upper hem belts 17, 18 and 19. By moving handle 46 upwardly (and locking it by means of arcuate slot 112 and wing nut-screw arrangement 114) that roll assembly simultaneously increases the tension on all of the upper hem belts 17, 18 and 19 by rotation of pin 45 connected to the handle. The tension on each of these upper hem belts 17, 18 and 19 may be individually adjusted by set screws (not shown) fixing the sleeves, such as 44, to pin 45. For example, the tension on belt 19 may alone be adjusted by loosening the set screw and rotating sleeve 44 clockwise, thus moving roll 41 toward belt 19, and locking the set screw. Each of the rolls such as 41 may be similarly adjusted and they all may be rotated simultaneously by use of handle 46 to adjust the tension on all of the upper hem belts 17, 18 and 19.

Lower hem belts 20, 21 and 22 are conveyed over table 2 in the same manner as belts 10, 11, 12, 13 and 14. The tension on lower hem belts 20, 21 and 22 may be similarly adjusted by roll assembly 100, mounted on member 116, which is identical to roll assembly 40.

In FIG. 4 a shirt front 80 is shown carried on table 2 by conveyor belts 10-14 and by the lower hem belts 20-22. Similarly, FIG. 2 shows a top view of shirt front 80 being carried on table 2 by conveyor belts 10-14 and lower hem belts 20, 21 and 22. FIG. 5 is a partial sectional view taken along line 5-5 showing fabric 80 being gripped between upper hem belts 17 and 18 and lower hem belts 20 and 21 as it passes to sewing head 65. The provision of more than one upper and lower hem belt is highly desirable in that it prevents puckering and other distortion of the fabric as it is carried, folded and sewn. Another principal feature of the invention is the provision of means for simultaneously adjusting by a single means the tension on all of the lower hem belts and for simultaneously adjusting the tension on all of the upper hem belts. Another feature is the provision of rolls which permit the individual adjustment of the tension of any one of the lower hem belts or any one of the upper hem belts.

In operation, a fabric such as shirt front 80 is placed on table 2 and carried to sewing head 65. At the front of table 2 the fabric is guided at its edge near the hem belts by a conventional edge guide not shown. The table near that edge is tapered inwardly so the fabric drops down as shown in FIG. 5. The fabric 80 is carried by belts 10 through 14 and at its edge by lower hem belts 20, 21 and 22. Lower hem belts 20, 21 and 22 cooperate with upper hem belts 17, 18 and 19 and grip the fabric at its edge where the hem is to be formed. The series of roll assemblies, such as 50-56, bearing on the inner portion of upper hem belts 17, 18 and 19 exert a positive control over the edge of the fabric in which the hem is to be formed and accommodate different thicknesses of fabric.

After the fabric 80 is conveyed to a point prior to the sewing head 65, it is passed through a conventional folder 110 which is disposed between lower hem belts 20, 21 and 22 and upper hem belts 17, 18 and 19. The lower hem belts 20, 21 and 22 pass below the folder 110 as shown in FIG. 3. The folding apparatus is shown in FIGS. 6, 7 and 8. As shown in FIG. 6, the fabric 80 at its edge comes in contact with a folder having side members 86 and 87 and a mandrel 82 mounted on side member 87. At this point a filler strip 84 may be introduced into the folder if desired by conventional means. As shown in FIG. 7 when the hem of the fabric has reached line 7-7 a folder scroll 88 has come into a horizontal position to complete the fold of the edge of fabric 80 having in between its top and bottom portions filler strip 84. The other edge of the fabric is also folded, to the configuration shown in FIG. 9, by a conventional tucker bar 90 (FIG. 8) prior to sewing the pleat. Prior to the tucker bar on the same side of the folder it has a tucker plow (which is conventional and is not shown) which begins to form a tuck which is then finally formed by tucker bar 90 between folder scroll 88 and plate 89 (FIG. 8). After the fabric 80 has been folded in the manner shown in FIG. 9, at sewing head 65 the fabric passes under presser foot 69 and over sewing base plate 67 and is then sewn by two needles such as 66 (see FIG. 1) in the positions of arrows 94 and 95 (FIG. 9), stitching the fabric at each side of the

hem. The sewing machine may be activated manually, or automatically by conventional sewing means.

The presser foot may be a conventional one or it may be the improved presser foot which is the subject of my copending application.

Another important feature of the apparatus of this invention is lower hem belt 21 which may be used as an aligning belt. For example, with a shirt front having stripes a stripe may be aligned on belt 21 and the belt adjusted by tension as necessary. This permits the production of a hem matching the stripes of the body of the fabric of the shirt. Also, this eliminates the need for accuracy in cutting the edge of the fabric, which may extend beyond the edge and be trimmed before the pleat is formed.

As may be seen from the foregoing description, the device of this invention permits the automatic production of a "one-piece" pleat more rapidly than a hand operation and gives a pleat free of pucker and other distortion. The pleats so formed may vary in width and may be formed from woven, nonwoven, knit or other fabrics of differing thicknesses.

I claim:

1. Apparatus comprising a table, a plurality of driven endless conveying belts travelling in a selected direction on top of said table; a first plurality of aligned driven endless lower hem belts near an edge of the table and travelling in said direction on top of said table; a second plurality of aligned driven endless upper hem belts of essentially the same length in one-to-one correspondence with said first plurality of hem belts travelling in said direction directly above said first plurality of lower hem belts, each one of said first plurality of belts being aligned with a different respective one of said second plurality of belts and coacting therewith to grip fabric therebetween to convey the fabric in said selected direction.

2. The apparatus of claim 1 wherein each of said lower hem belts is essentially the same length.

3. The apparatus of claim 1 wherein means are provided for simultaneously adjusting the tension on all of the lower hem belts.

4. The apparatus of claim 1 wherein means are provided for simultaneously adjusting the tension on all of the upper hem belts.

5. The apparatus of claim 1 wherein there are three lower hem belts of essentially the same length, there are three upper hem belts of essentially the same length, and in which means are provided for simultaneously adjusting the tension on all of the lower hem belts and means are provided for simultaneously adjusting the tension on all the upper hem belts.

6. The apparatus of claim 5 comprising also means for individually adjusting the tension on each of the lower hem belts and on each of the upper hem belts.

7. The apparatus of claim 5 comprising also a plurality of roller assemblies disposed along the length of the upper and lower hem belts and bearing on them, each such assembly comprising at least one roller fixed in place horizontally, and free to move vertically and bearing on top of one or more upper hem belts, thereby to exert a positive control on fabric being conveyed between the upper and lower hem belts and to accommodate any thickness of fabric being so conveyed.

8. Apparatus as in claim 1, and folding means positioned in the path of travel of fabric for folding said fabric, and means for separating said first and second plurality of hem belts in the vicinity of said folding means to release the fabric so that the fabric can be folded.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,918,573
DATED : November 11, 1975
INVENTOR(S) : Wesley P. Farney

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 3, line 10, change "urives" to --drives--

Col. 3, line 15, change "]re" to --are--

Col. 3, line 15, change "7asses" to --passes--.

Signed and Sealed this

tenth Day of February 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks