United States Patent [19]

Speer

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[45] **Nov. 26, 1974**

[54] **HEMMING MACHINE**

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[73] Assignee: **Spear Systems, Inc.,** Campbellsville, Ky.

[22] Filed: **Nov. 6, 1972**

[21] Appl. No.: **304,064**

[52] **U.S. Cl.**..... **112/121.29,** 112/147, 112/208

[51] **Int. Cl.**..... **D05b 35/02**

[58] **Field of Search**..... 112/121.11, 121.12, 121.15, 112/121.29, 262, 10, 121.26, 208, 209, 141, 147; 38/2, 143; 270/68 R

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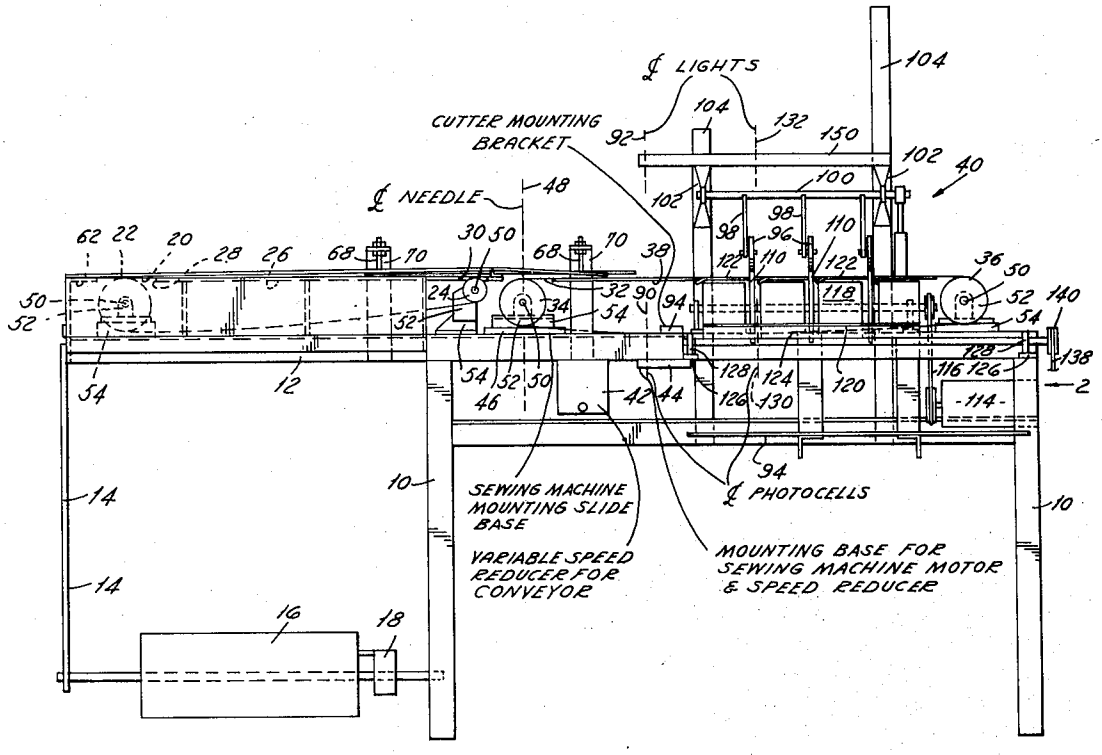
Attorney, Agent, or Firm—Farley, Forster and Farley

[57] **ABSTRACT**

The invention comprises a semi-automatic machine for folding cloth pieces, stitching the folded cloth pieces to form hems thereon, and stacking the stitched pieces into bundles for further processing. In the preferred embodiment the hemming machine utilizes form plates situated just above a conveyor to fold the cloth pieces progressively as they approach the sewing needle. At the sewing needle, a second conveyor, running at a slightly higher linear speed, takes up the folded cloth pieces thereby stretching them to remove unwanted wrinkles and assure an even, smooth stitched hem. The second conveyor carries the cloth pieces to an unloading and stacking mechanism which removes the cloth pieces from the conveyor and flips them over onto a bundle which can then be ejected from the machine periodically.

10 Claims, 10 Drawing Figures



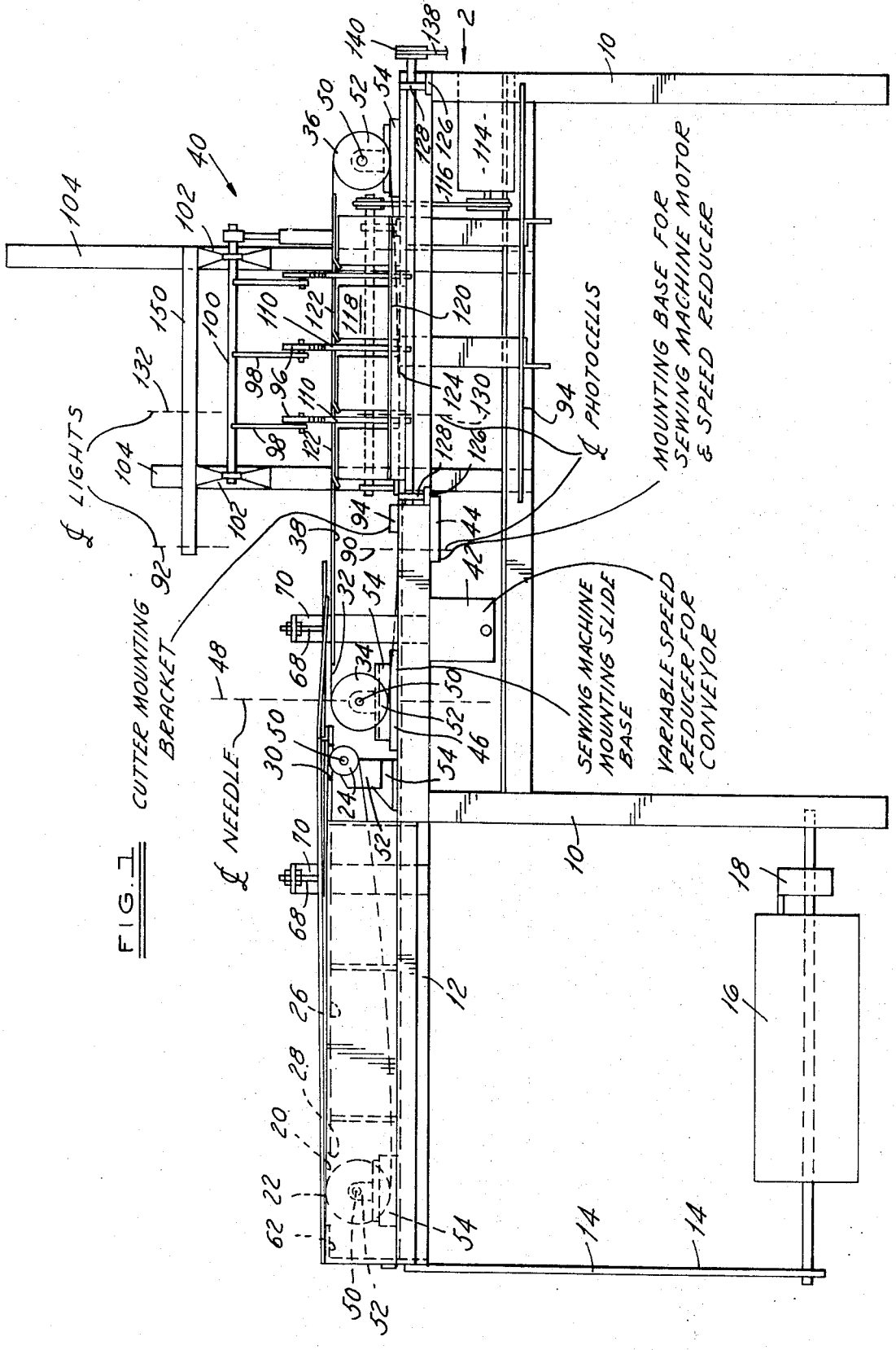
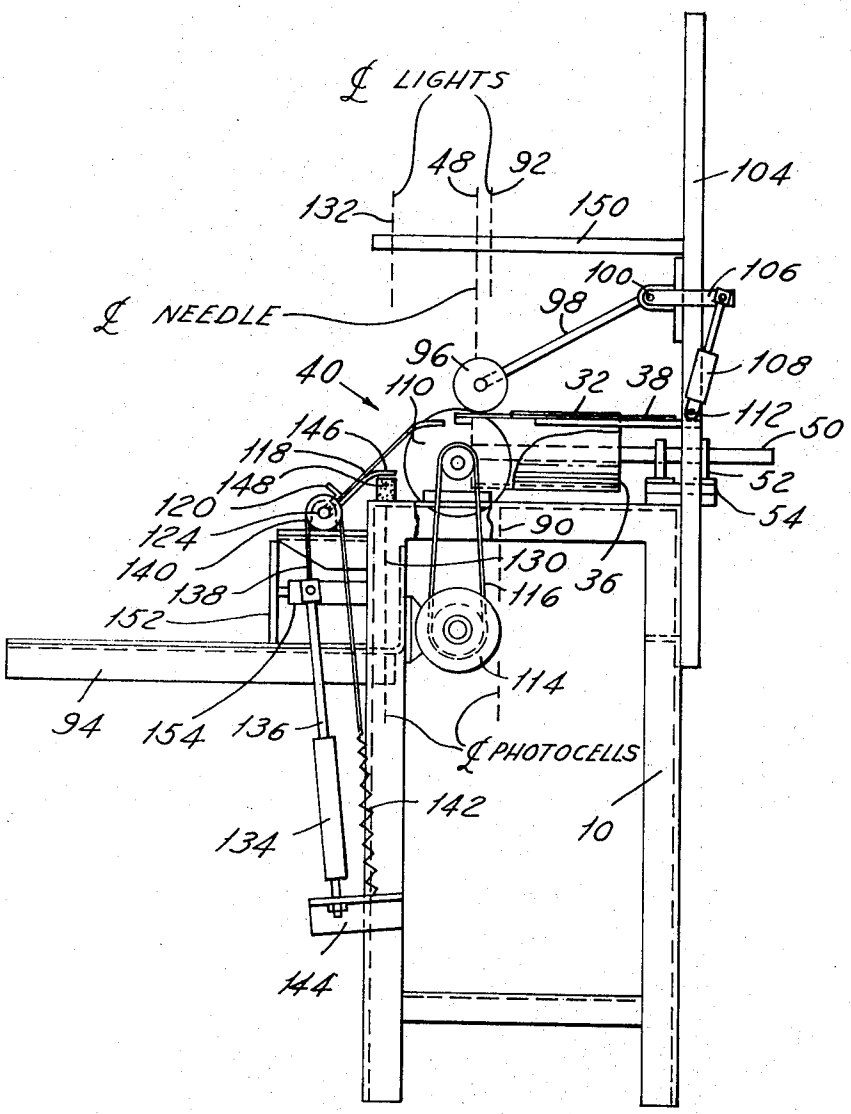

℄ LIGHTS
CUTTER MOUNTING BRACKET
℄ NEEDLE
SEWING MACHINE MOUNTING SLIDE BASE
VARIABLE SPEED REDUCER FOR CONVEYOR
℄ PHOTOCELLS
MOUNTING BASE FOR SEWING MACHINE MOTOR & SPEED REDUCER

FIG. 1

FIG. 2


℄ LIGHTS
48
92
104
132
150
100
106
℄ NEEDLE
98
96
108
40
110
32
38
112
146
50
118
148
52
120
54
124
90
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130
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138
116
152
114
94
154
136
℄ PHOTOCELLS
142
10
134
144

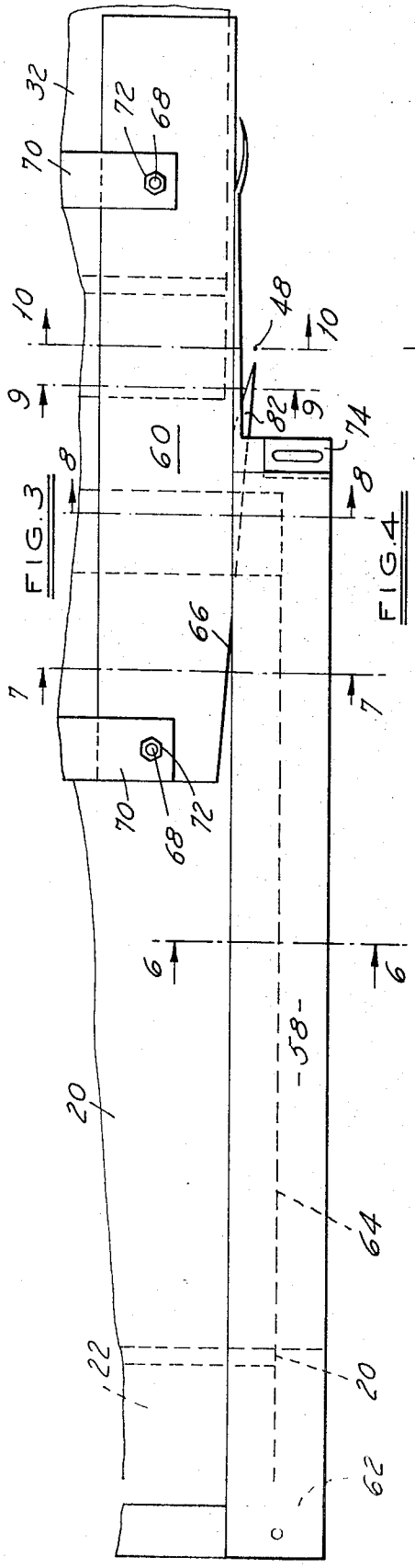


FIG. 3

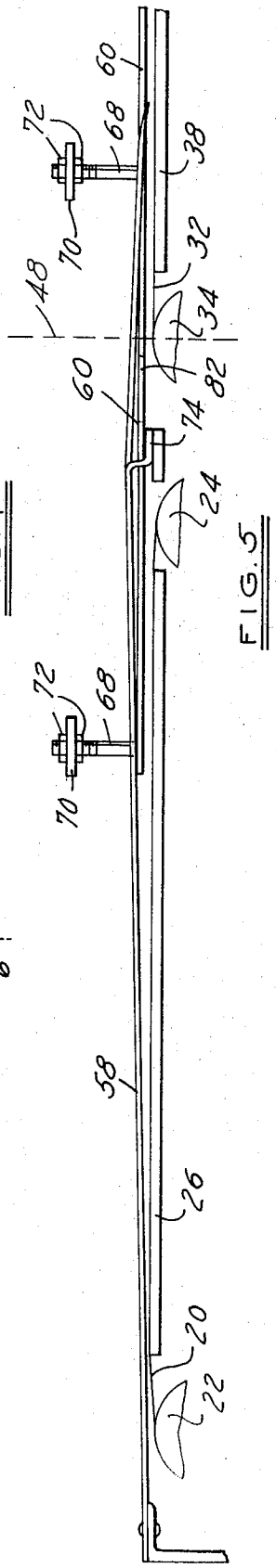


FIG. 4

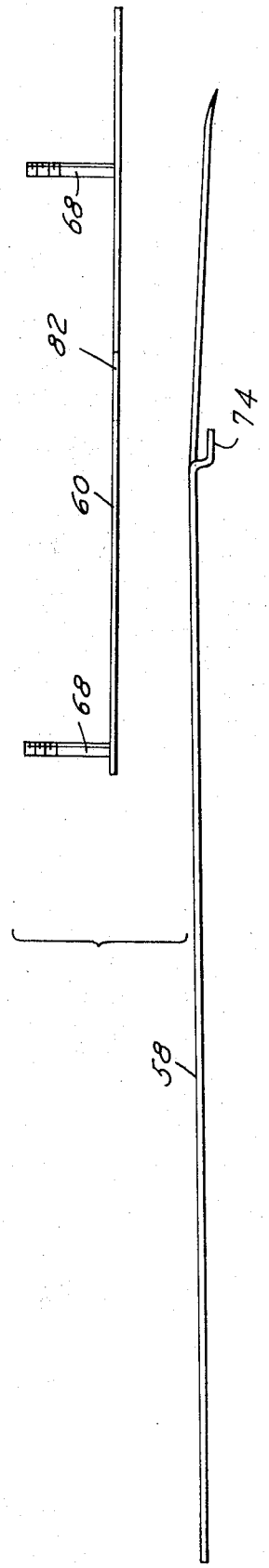


FIG. 5

FIG. 6

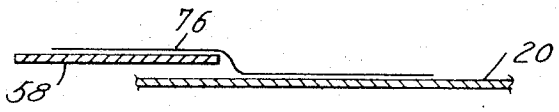


FIG. 7

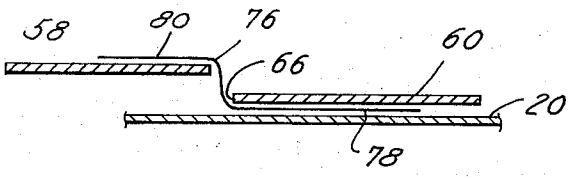


FIG. 8

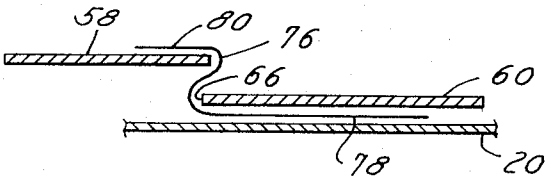


FIG. 9

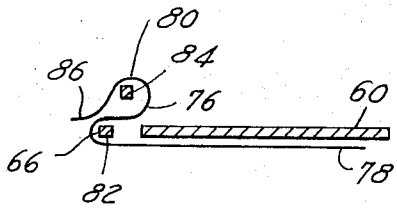
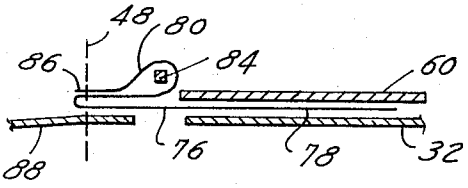


FIG. 10



HEMMING MACHINE

BACKGROUND OF THE INVENTION

The invention pertains to the field of sewing pieces of cloth, in particular, hem stitching the sleeves of garments prior to attaching the sleeves to the garments. As is well known, a variety of stitching patterns may be utilized to hem stitch a sleeve. The hem is folded prior to stitching in a manner appropriate to the particular hem stitch that is put on the sleeve. On a mass production basis, the folding and stitching are preferably done automatically with the operator of the machine merely placing and positioning the sleeve pieces on the conveyor in a manner that allows the machine to fold the cloth properly and stitch the hem. Typically, the prior art machines include a single belt conveyor which carries the cloth pieces past compressed air jets or blower nozzles situated to fold a portion of each cloth piece about form plates to form the hem prior to passage on the conveyor past the sewing needle which automatically stitches the folded cloth hem.

SUMMARY OF THE INVENTION

The invention comprises a semi-automatic machine for folding cloth pieces, stitching the folded portion of each cloth piece to form the hem thereon and stacking the stitched pieces into bundles for further processing. The hemming machine is adapted to utilize conventional sewing machines with the proper hem stitching attachments and photocell controlled conventional cutters for separating the sewn threads between sequential pieces of cloth stitched by the sewing machine. In the preferred embodiment the hemming machine utilizes form plates situated just above a conveyor to fold the cloth pieces progressively as they approach the sewing needle. At the sewing needle a second conveyor, running at a slightly higher speed, takes up the folded cloth pieces, thereby stretching them progressively to remove unwanted wrinkles and assure an even, smooth stitched hem. The second conveyor carries the cloth pieces into an unloading and stacking mechanism which removes them from the conveyor and upon a signal from a second photocell control flips them over onto a bundle which can then be ejected from the machine periodically. The operator of the machine merely places the cloth pieces on the conveyor at the proper location sequentially and the hemming machine completes the hemming and stacking with the operator merely ejecting completed bundles periodically.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevation of the hemming machine;

FIG. **2** is an end elevation of the hemming machine taken from the direction **2** of FIG. **1**;

FIG. **3** is a top elevation of the form plates suspended above the conveyor;

FIG. **4** is a side elevation of the form plates in assembled position;

FIG. **5** is a side elevation of the form plates in exploded view;

FIG. **6** is a schematic cross section of the form plates and cloth taken at line **6—6** of FIG. **3**;

FIG. **7** is a schematic cross section of the form plates and cloth taken at line **7—7** of FIG. **3**;

FIG. **8** is a schematic cross section of the form plates and cloth taken at line **8—8** of FIG. **3**;

FIG. **9** is a schematic cross section of the form plates and cloth taken at line **9—9** of FIG. **3**; and,

FIG. **10** is a schematic cross section of the form plates and cloth taken at line **10—10** of FIG. **3**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIGS. **1** and **2**, a steel table **10** suitably provides a supporting base for the hemming machine. Extending from the left end of the table **10** in FIG. **1** is a supporting bracket **12** and downwardly extending steel plate **14**, which, in turn, supports a treadle **16** and treadle valve **18** located for ease of operation by the feet of the hemming machine operator. Mounted on the bracket **12** is a first belt conveyor **20** extending from conveyor roller **22** to conveyor roller **24**. The upper flight of the conveyor **20** moves to the right on a supporting plate **26** having gaps **28** and **30** for the passage of the conveyor **20** onto the rollers **22** and **24**. The operator who sits in front of the treadle **16** places the pieces of cloth on the conveyor **20** as will be further explained below. A second conveyor **32** extends between conveyor rollers **34** and **36**, the upper flight of which moves also to the right on a supporting plate **38**. Cloth pieces leaving conveyor **20** are picked up by conveyor **32** and moved into the unloader and stacker generally denoted by **40** in FIG. **1**.

A bracket **42** is fastened to the table **10** to support a speed reducer with variable speed pulleys connected to conveyor **32** which enables the belt speed of conveyor **32** to be adjusted relative to the belt speed of conveyor **20**. A bracket **44** is also attached to the table **10** to support an electric motor and clutch to drive conveyor **20** and the speed reducer attached to bracket **42**. A third bracket **46** extending outwardly from the drawing and attached to the table **10** supports a sewing machine also driven by the electric motor mounted on the bracket **44** and speed reducer on bracket **42**. Thus conveyor **20**, the sewing machine and conveyor **32** are all driven by a single motor located on the bracket **44**. The treadle **16** and treadle valve **18** control the clutch on the electric motor. As further explained below, the speed reducer mounted on the bracket **42** normally will be set to produce a conveyor speed for conveyor **32** and operating speed for the hemming head needle at the location indicated by the line **48** slightly in excess of the conveyor speed for conveyor **20**. The motor, speed reducer and sewing machine are items well known in the art and omitted from the drawings to enhance the clarity of the novel hem producing features of the hemming machine. Each of the conveyor rollers **22, 24, 34** and **36** is cantilever mounted on shafts **50** in turn supported on brackets **52** and pads **54** in a conventional manner.

in FIGS. **3, 4** and **5**, the folding means for the cloth pieces comprise a lift plate **58** and a form plate **60**. The lift plate **58** is attached by a bracket **62** to the bracket **12** at the leftmost end of the hemming machine. The lift plate **58** gradually rises toward the right as it approaches the needle at **48**. As indicated in FIG. **3**, the first conveyor **20** extends under the lift plate at **64** and pieces of cloth are placed by the operator on the conveyor **20** with a portion, usually about half in the case of short sleeves, resting upon the lift plate **58**. The conveyor **20** carries each cloth piece rightwardly and the portion of the cloth on the lift plate is gradually lifted upwardly until it is about one-half to three-fourths of an

inch above the form plate **60.** The form plate **60** is suspended from the conveyors **20** and **32** by studs **68** which in turn are fastened to brackets **70** with double nuts **72.** The brackets **70** in turn are fastened behind and below the conveyors to the table **10** as best shown in FIG. **1.** The lift plate **58** is suitably fastened at the right end **74** to the end of the conveyor support plate **26.** The form plate **60** is supported above the conveyors **20** and **32** with sufficient clearance for the portion of the cloth piece that is on conveyor **20** to pass below. The form plate **60** includes an angular edge **66** which causes a portion of the cloth piece to be progressively pushed under the lift plate **58.** This progressive folding action is best shown by the sequence of schematics in FIGS. **6** thru **10.**

In FIG. **6,** a typical piece of cloth **76** is placed on the conveyor **20** and the lift plate **58** as shown. In FIG. **7,** as the piece of cloth **76** moves along the conveyor, the right hand portion **78** passes beneath the form plate **60** while the left hand portion **80** is lifted by the lift plate **58.** As shown in FIG. **8,** the edge **66** causes the cloth piece **76** to be progressively folded underneath the lift plate **58** by gently pulling a portion of the cloth **80** partially from the lift plate **58.** The form plate **60** includes a tongue **82** extending angularly therefrom to provide an extension of the edge **66.** In FIG. **9** the tongue **82** continues to tuck under the cloth portion **80;** however, a second tongue **84** sloping downwardly as a continuation of the lift plate **58** retains a portion of the cloth **80** above while the left hand edge **86** of the cloth piece drops downwardly. At this point the cloth piece **76** is passing from the left hand conveyor **20** to the right hand conveyor **32.** The tongue **82** attached to the form plate **60** directs the lower folded portion of the cloth piece toward the needle as best shown in FIG. **3** so that, as shown in FIG. **10,** the leftmost edge of the cloth **86** has dropped onto the portion of the cloth folded by the tongue **82** in proper alignment for the path of the needle as shown by **48.** The rightmost portion of the cloth piece **78** is supported by the conveyor **32** at this point and the leftmost portion **86** including the fold below is supported by the platen of the sewing machine, as indicated by **88.**

In normal operation, the operator places cloth pieces **76** on the conveyor **20** sequentially with the conveyors and sewing machine operating continuously. As each cloth piece **76** passes beyond the position shown in FIG. **10,** it passes between a photocell at **90** and corresponding light source at **92.** The photocell at **90** is operatively connected to a thread cutter located on the base **94** which cuts the sewn thread extending between sequential pieces of cloth and created by the continuous operation of the sewing machine. The cloth pieces are carried beyond the cutter into the unloader and stacker **40** which operates to automatically unload each cloth piece from the conveyor **32** and stack the pieces in a bundle located on the shelf **94** which is attached to the table **10.** In addition to controlling the thread cutter, the photocell at **90** also controls idler rollers **96** mounted on arms **98** in turn fastened to a pivot shaft **100.** The pivot shaft **100** is supported in brackets **102** in turn fastened to stanchions **104** attached to the back of the table **10.** Attached to the pivot **100** in a crank arm **106** and air cylinder means **107** adapted to lift the idler rollers **96** about three-fourths inch above the stacking rollers **110.** The air cylinder **108** is pivotally attached at **112** to one of the stanchions **104.** The stacking rollers **110** are continuously rotated by a separate electric motor **114** and belt drive **116.** The photocell located at **90** causes, by means of a conventional electro pneumatic control, the air cylinders to lift the idler rollers **96** from the stacking rollers **110** and thereby allow each piece of cloth **76** to pass therebetween. As the photocell **90** senses the following piece of cloth, the air cylinder at **108** is released, the idler rollers **96** drop toward contact with the stacking rollers **110** gripping the cloth piece therebetween and pulling it perpendicularly from the conveyor **32.** As will be noted from FIG. **2,** the hemmed edge of the cloth piece approaches the idler rollers **96** and is pulled onto the stacking rollers **110** by the conveyor **32,** as shown by the location of the needle **48** therebeyond.

Each cloth piece ejected by the rollers **96** and **110** slides down onto the stackers **118** and against the stop **120.** The tongues **122** attached to the conveyor support plate **38** assure that the cloth piece moving along the conveyor **38** will be forced to ride up on top of the stacker rollers **110** when the idler rollers are raised and thereby assure that ejection by the idler rollers **96** will cause the cloth pieces to slide down on top of the stackers **118.** The stackers **118** are pivoted on a shaft **124** in turn attached to the table frame **10** by brackets **126** in turn supporting pivot brackets **128.** A second photocell mounted at **130** in combination with a light source mounted at **132** actuates the pivot shaft **124** to rotate the stackers **118** thereattached, flipping over the cloth piece onto a bundle on the shelf **94.** The actuation means comprises the air cylinder **134,** having the piston rod thereof **136** attached to a chain **138** in turn wrapped about a sprocket **140** attached to the end of the shaft **124.** The other end of the chain **138** is attached to a spring **142** in turn attached at the other end to the table **10** by means of a bracket **144** which also holds the cylinder end of the cylinder **134** as shown best in FIG. **2.** In relaxed position, as shown in FIG. **2,** the stackers **118** include a second stop **146** which rests upon rubber blocks **148** in turn attached to the top of the table **10.** Thus, as each piece of cloth slides down onto the stackers **118,** the second photocell located at **130** electropneumatically actuates the cylinder **134** flipping the cloth piece over automatically. The light sources at **132** and **92** are mounted on a bracket frame **150** located above the unloader and stacker. These actuating sources may of course be positioned wherever appropriate depending upon the sizes of cloth pieces sewn and the proper timing required for operation which will depend partially upon the operating speed of the conveyor. In typical operation, the hemming machine will operate at a pace of 1 or 2 seconds per shirt sleeve.

Returning to the hemming operation per se at the location of the needle **48,** the second conveyor **32** is preferably adjusted to operate at a linear speed approximately 5 percent greater than the linear speed of conveyor **20.** As noted above the sewing machine is also operated at a linear speed of the cloth equal to the speed of conveyor **32.** The acceleration put upon the cloth as it passes from conveyor **20** to conveyor **32** removes wrinkles that may be in the cloth just prior to hemming, thereby assuring that a proper smooth hem stitch is completed on each cloth piece. Adjustments in the relative speeds of course are possible depending upon the particular material being sewn and the size of the cloth pieces. Returning to FIG. **10,** it will be noted

that, in the sewing process, an extra fold is provided by the position of the portion of the cloth piece **80** relative to the rest of the cloth piece **78.** As the cloth piece is carried along the conveyor **32** and is released from the extending tongue **84** of the lift plate **58,** this portion of the cloth **80** will tend to flip over to the left and with engagement of the rollers **96** and **110** this unfolding will be assured. Thus, this particular form plate and lift plate provides a particular fold for the final hem. Periodically, the operator by means of a switch or button, not shown, but conveniently located can actuate a bundle mover **152** by means of an air cylinder and piston **154** positioned between the bundle mover **152** and the table **10.** The bundle mover **152** will push bundles off the shelf **94** onto a portable receptacle, not shown, or other means of moving bundles from the hemming machine. The position of the bundle mover is best shown in FIG. **2** and has been deleted from FIG. **1** in order to permit clarification of the other mechanism.

I claim:

1. A hemming machine, comprising; means to convey a piece of cloth past sewing means, progressive folding means adjacent said conveyor means adapted to double fold an edge of the cloth piece prior to sewing, said folding means including progressive elevating means to lift an edge portion of the cloth piece, progressive forming means overlying and parallel to said conveyor having a marginal edge extending angularly to the path of said conveyor under said elevating means to double fold and tuck a portion of the cloth piece under said elevated edge portion of said cloth piece.

2. The hemming machine of claim **1** wherein said elevating means comprises a lift plate extending partially over and generally upwardly, along and parallel to said conveyor means and said forming means comprises a form plate located above said conveyor means and extending progressively under said lift plate.

3. The hemming machine of claim **1** wherein said conveyor means comprise at least two conveyors adapted to stretch the piece of cloth extending therebetween and thereby remove wrinkles.

4. The hemming machine of claim **1** wherein said conveyor means include at least two conveyors located in series, the second conveyor moving at a linear rate slightly in excess of the first conveyor to thereby stretch the piece of cloth and remove wrinkles.

5. The hemming machine of claim **1** including unloading means adjacent said conveyor means and adapted to remove cloth pieces from the conveyor means.

6. The hemming machine of claim **5** wherein said unloading means include means to engage individual pieces of cloth and pull them from the conveyor means.

7. The hemming machine of claim **5** wherein stacking means are located adjacent and unloading means and adapted to receive and stack the cloth pieces into a bundle.

8. The hemming machine of claim **7** wherein said stacking means include means to over turn each cloth piece onto the bundle and means to periodically unload each bundle from the stacking means.

9. The hemming machine of claim **7** wherein said stacking means include automatic means to sense the receipt of a cloth piece and actuate the stacking means.

10. The hemming machine of claim **5** wherein said unloading means include automatic means to sense the passage of a cloth piece and actuate the unloading means.

* * * * *