

Aug. 25, 1959

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2,900,934

COMBINATION MATERIAL DOUBLER AND SEAM OPENER

Filed April 20, 1955

2 Sheets-Sheet 1

FIG. 1.

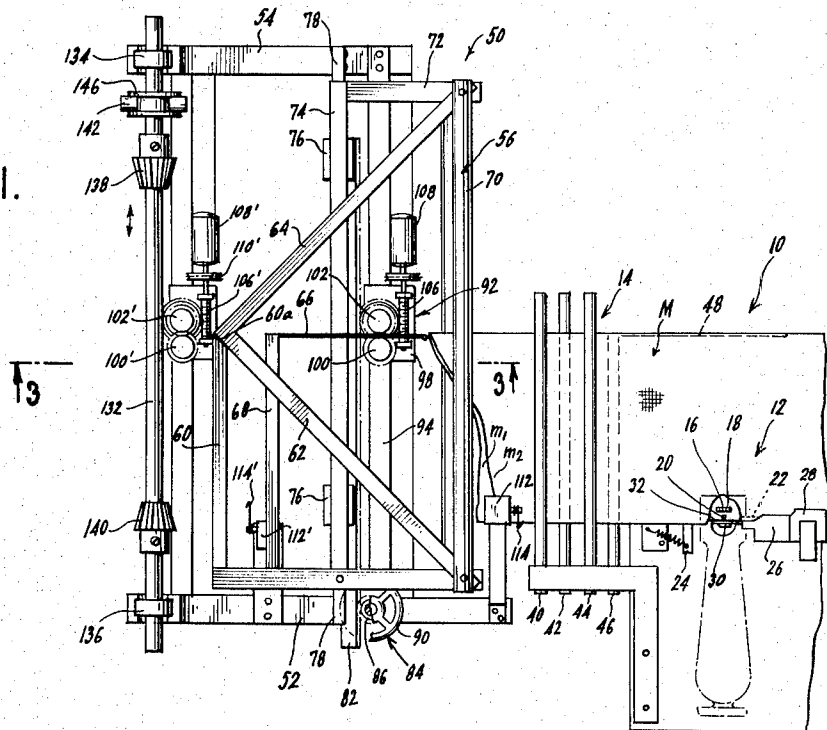


FIG. 3.

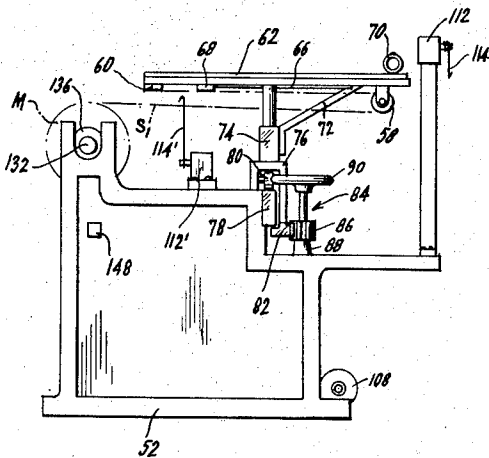
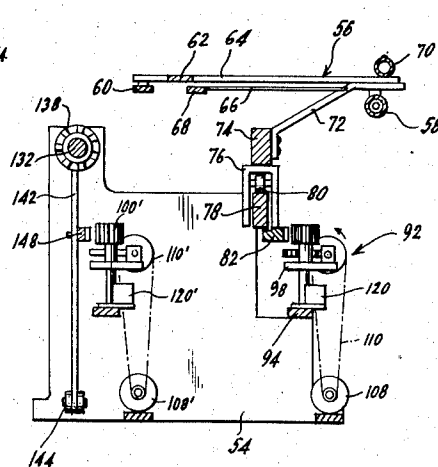


FIG. 2.



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2 Sheets-Sheet 2

FIG. 4.

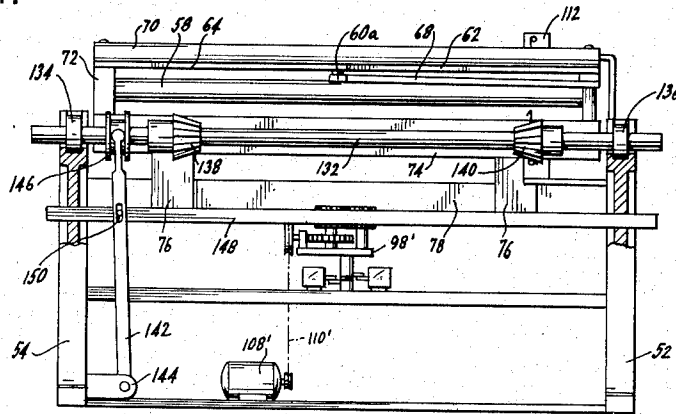


FIG. 6.

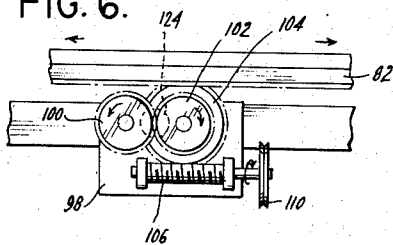
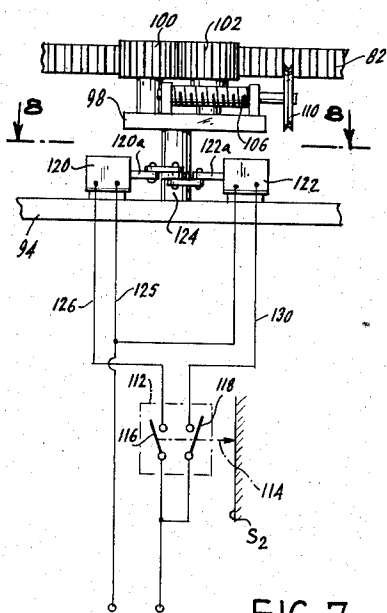


FIG. 7.

FIG. 5.

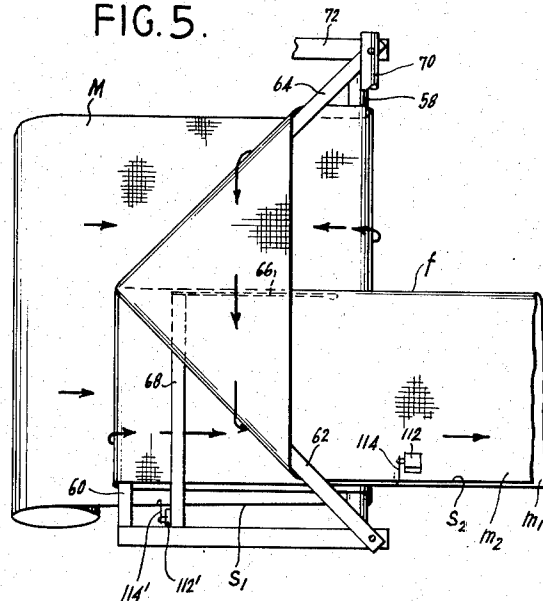
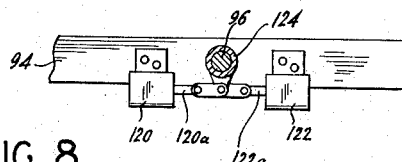


FIG. 8.

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2,900,934

COMBINATION MATERIAL DOUBLER AND SEAM OPENER

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Application April 20, 1955, Serial No. 502,620

11 Claims. (Cl. 112—63)

The present invention relates to devices for forming a length of fabric into a continuous tube, and in particular to combined folding and stitching mechanisms for folding a length of material about a longitudinal median line with opposite side edges in substantial registry and for forming a stitched seam along a predetermined path spaced inwardly of the registering side edges.

Folding and turning apparatus are known for use with conventional sewing machines for joining two superposed layers of the folded fabric along coextensive side edges by a line of stitching spaced inwardly from the side edges and for separating the margins of the fabric along and outwardly of the line of stitching. Typical tube-forming apparatus includes a sewing machine having a presser foot, a needle and a feed dog arranged in cooperating relation to form a line of stitching in the folded length of fabric as it is delivered along a predetermined feed path. Trailing the sewing machine is a specially formed turning block, which in association with a flat blade separates the margins and turns the margins back in directions opposite to each other and toward the respective underlying layers of the body portion of the tube. After such folding and turning back, appropriate means are provided to permanently set the turned back margins in open condition. The details of an improved structure embodying this known arrangement may be found in my copending application, Serial No. 467,933, filed November 10, 1954, now Patent No. 2,753,823, dated July 10, 1956.

Broadly, it is an object of the present invention to provide a material doubler for use in conjunction with such tube-forming apparatus which folds a length of material about a longitudinal median line in advance of the tube-forming apparatus.

In the utilization of the tube-forming apparatus, it has heretofore been the practice to employ an operator to manually feed a folded length of material to the sewing mechanisms to form a seam along the registering side edges remote from the fold. Conventionally, a vertical oscillatory knife is mounted adjacent the needle to shear away the margins outwardly of the stitch line such that the margins are trimmed to a predetermined width. Such margins are usually of the order of $\frac{3}{32}$ to $\frac{1}{8}$ of an inch. However, material for a given width frequently varies in said width throughout the length; that is, the material may be somewhat narrower than the established width in some regions and somewhat wider than the established width in other regions. Thus, the operator necessarily adjusts the lateral position of the goods in relation to the needle and to the oscillatory cutting knife to assure the desired width of margin, yet to avoid excessive trimming of the material.

It is a further object of the present invention to provide doubling mechanisms for automatically delivering a folded-over length of material to stitching and seam-opening apparatus which virtually eliminates the need of an operator. To advantage, such doubling mechanisms allow for operation of the combined stitching and seam-opening

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apparatus by the operator, as when handling special types of goods and/or relatively short lengths.

In the manufacture of the seamed tube, which is ultimately bias cut for binding tapes and the like, it is not uncommon for the supply of goods to be either in roll form or flat folded condition. In the delivery of such materials to doubling mechanisms according to the present invention, the relative position of the supply in relation to the doubler may change. For example, when the goods is in roll form, it is not uncommon to have imperfect edge registration throughout the radial extent of the roll. As the position of one edge, designated as the reference edge, changes in relation to the doubling mechanisms, it will be appreciated that the orientation of the doubled length of material in relation to the stitching apparatus likewise changes. This may result in excessive trimming of the margins outwardly of the stitch line, or improper functioning of the stitching mechanisms. This problem is further complicated internally of the doubling mechanisms by the fact that the goods may run wider and narrower than the width prescribed by the manufacturer.

Accordingly, it is a further object of the present invention to provide doubling means for use in conjunction with tube-forming apparatus in which the doubled length of goods is delivered to the tube-forming apparatus in an oriented position, despite variations in the location of the material supplied to the doubling mechanisms and/or variations in width of the goods being fed through the doubling mechanisms.

A still further object of the present invention is to provide doubling mechanisms for use with tube-forming apparatus which is capable of receiving material either in roll form or in flat folded condition.

In accordance with an illustrative embodiment demonstrating features of the present invention, in combination with stitching mechanisms operative along a predetermined path for forming and opening a stitched seam at one side of a folded length of material having a reference edge and a folded over edge, there is provided material-doubling means which folds the material longitudinally in half about a longitudinal median line to bring the folded over side edge into substantial registry with the reference side edge. The material doubling means, in a preferred embodiment, includes a support, a doubling frame for folding the material about said median line, the doubling frame being mounted for side-to-side adjustment such that the registering side edges of the folded length of material may be brought into an oriented feed position relative to the predetermined path along which the stitching mechanisms are operative, sensing means along the path of travel of the registering side edges for sensing deviations of the folded over side edge beyond established limits from the oriented position, and adjusting means operatively connected to the doubling frame and operative under control of the sensing means for maintaining the folded over side edge within the established limits. Thus, if the width of the material decreases, such that the folded over side edge is displaced beyond one limit, the folded over side edge will be restored to within the established limits; conversely, if the material increases in width such that the folded over side edge goes beyond the other limit, the doubling frame will be appropriately shifted to restore the folded over side edge to within the established limits. The automatic control over the position of the folded over side edge assures proper functioning of the tube-forming apparatus.

As a further feature of the invention, sensing means are provided along the path of travel of the reference side edge for sensing deviations of the reference side edge beyond established limits from the oriented feed position, and further adjusting means are operatively connected to

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the material supply such as to restore the reference side edge to within the established limits. Thus, for imperfect edge registration of the supply of goods in relation to the doubling mechanisms after a period of operation, the reference side edge is restored to within the established limits.

The above objects, brief description and still further features and advantages of the present invention will be best appreciated by reference to the following detailed description of an illustrative embodiment, when taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a plan view of doubling mechanisms embodying features of the present invention, shown in advance of tube-forming apparatus according to the mentioned copending application;

Fig. 2 is an end elevational view of the doubling mechanisms shown in Fig. 1;

Fig. 3 is a sectional view of the doubling mechanisms taken substantially along the line 3—3 of Fig. 1;

Fig. 4 is a rear elevational view, with parts broken away and sectioned, of the doubling mechanisms shown in Fig. 1;

Fig. 5 is a fragmentary plan view, slightly in perspective, showing the material feed path through the doubling mechanisms;

Fig. 6 is a fragmentary plane view on an enlarged scale showing part of the adjusting means for shifting the doubling frame from side to side;

Fig. 7 is a fragmentary elevational view, with circuit connections shown schematically of the adjusting means; and,

Fig. 8 is a fragmentary elevational view taken substantially along the line 8—8 of Fig. 7.

Referring now specifically to the drawings, there is shown at the right side of Fig. 1 part of the combined stitching, folding, pressing and windup mechanisms for joining two superposed layers of a folded fabric along one side edge by a line of stitching to form a continuous tube, as disclosed in my mentioned copending application. Although the doubling apparatus to be described is found to be particularly advantageous in operation with the tube-forming apparatus of my mentioned application, it is to be expressly understood that the doubling apparatus finds application with other tube forming devices, for example as shown in U.S. Patent No. 1,549,484 of August 11, 1925. The illustrative tube-forming apparatus, generally designated by the reference numeral 10, forms and opens a seam *s* in one side of a piece of material *M* which includes superposed layers or runs *m*₁, *m*₂ folded centrally about a fold line *f*. The apparatus includes a seam-forming and opening station 12, a pretensioning and feeding system 14 in advance of the seam-forming and opening station 12, and wind-up and pulling mechanisms (not shown). The sewing mechanisms at the station 12 are conventional and include a feed dog 16 movable through a feed slot or throat in the feed bed 18, a vertically reciprocable needle 20. Secured to and operable with the needle is a trimmer 30 in the form of a vertical oscillating blade having a shearing edge which is adapted to coact with a fixed blade secured within a well on the feed bed. The coaction of the feed dog 16, the needle 20 and of the fixed and movable blades of the trimmer 30 is such that the upper and lower layers *m*₁, *m*₂ of the material *M* are stitched along the side remote from the fold lines *f* and the marginal portions are trimmed along lines substantially parallel to the stitch line 22. The thus formed marginal portions ultimately are folded over upon the adjacent layers of the tubular body by the turning mechanisms 26 and are ironed down by the presser 28. The material *M* is guided in the linear stitch path from the needle to the turning mechanisms by a guide wire 32 anchored at its leading end on a bracket 24.

The pretensioning and feeding system 14 in advance of the stitching station conjointly with the takeup or windup mechanisms (not shown) maintains uniform ten-

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sion in the width and the length of the material *M* during passage through the station 12. The pretensioning and feeding system includes sets of tensioning bars 40, 42 and 44, 46. The tensioning bar 46 carries at its end remote from the sewing mechanisms, a longitudinally extending fold-forming member 48 in the form of a thin wire fabricated of springy material, which exerts a lateral biasing effect on the goods *M* during its passage through the station 12. For further details of the station 12, the pretensioning and feeding system 14 and the winding and pulling mechanisms, reference may be made to the mentioned copending application.

In accordance with the present invention, there is provided material-doubling apparatus, generally designated by the reference numeral 50, which includes a base or supporting frame having uprights 52, 54. Mounted on the base or support is a doubling frame 56 which is supported for side to side adjustment in relation to the tube-forming apparatus 10. The doubling frame 56 includes an idler roller 58 in advance of and parallel to the pretensioning bars, a doubling member 60 in the form of a flat bar in advance of and parallel to the idler roller 58 and angularly disposed doubling members 62, 64. The doubling bar or member 60 includes an end 60*a* terminating along the longitudinal center line of the doubling frame 56 at which terminal end the doubling bars 62, 64 meet at an apex. Such doubling frame is broadly known to the art and as seen in Fig. 5, the material is wrapped around the idler roller 58, doubled back beneath the frame 56, and wrapped around the material-turning edge provided by the doubling bar 60 in one half section *m*₁, and about the material-turning edges of the angular doubling bars 62, 64 which turn the other half section *m*₂ of the material *M* into superposed relation relative to the unturned half section *m*₁. For a purpose which will hereinafter become apparent, the side edge *s*₁ of the unturned half section *m*₁ will be referred to as the reference side edge, while the side edge *s*₂ of the turned half section *m*₂ will be referred to as the folded over side edge.

The doubling frame 56 further includes a doubling member or bar 66 having a material-turning edge lying substantially along longitudinal center line or axis of symmetry of the doubling frame, the member 66 being supported by an arm 68 anchored to the body of the doubling frame. The doubling member 66 serves as a fold former and preferably is of springy material such that it exerts an outward biasing effect on the material along the fold line *f*. As seen in Fig. 3, the doubling member 66 and its supporting arm 68 are disposed below the plane of the angular doubling bars 62, 64 such that as the goods emerges from about the material-turning edge of the doubling bar 62 and over the doubling bar 60, the same may be extended on opposite sides of the doubling member 66 which then lies within the fold. Extending over the doubling frame at a location above the idler roller 58 is a further idler roller 70 under which the goods passes as it travels toward the pretensioning bars of the tube-forming apparatus.

The entire doubling frame 56 including the parts 60, 62, 64, 66 and 68 as well as the idler rollers 58, 70 are supported by means of appropriate depending brackets 72 on a beam or cross bar 74 which extends between the opposite uprights 52, 54. Depending from the beam or cross bar 74 are spaced trolleys 76 of U-shaped cross-section which encircle a track 78 and are supported thereon by appropriate rollers or bearings 80. Thus, it will be seen that the generally horizontal doubling frame 56 is adjustable in a horizontal plane in the glide path provided by the track 78.

Actuating means including an automatic control and a manual control are operatively connected to the doubling frame 56 for effecting side to side adjustment. In the illustrative embodiment, such actuating means includes a rack 82 which is fixed to the forward legs of the trolleys 76 and extends for a substantial extent across the width

of the machine from the upright 52 toward the upright 54. The rack 82 may be displaced by a manual control generally designated by the numeral 84, which is mounted on the upright 52. The manual control 84 includes a pinion 86 journaled on an appropriate stub 88, the pinion being in meshing engagement with the rack 82 and turnable by a hand wheel 90.

The automatic control for driving the rack, generally designated by the reference numeral 92, includes a shelf-like support 94 upon which is mounted an upright stud 96. The stud 96 receives a sleeve 124 which is secured to a bracket 98 which is rockable about the stud 96. On the bracket 98 is supported a pair of meshing pinions 100, 102 which are engageable in alternation with the rack 82 as the bracket 98 is rocked about the stud 96. Fixed to the pinion 102 is a gear 104 which is driven from a worm 106 journaled on the bracket 98. The worm 106 is coupled to an appropriate driving motor 108 via the belt and pulley coupling 110. The direction of rotation of the motor and the thread of the worm and meshing gears is selected such as to cause the rack to travel to the right or left depending upon which of the gears 100, 102 is engaged with the rack.

As shown in Fig. 3, for motor shaft rotation in the counterclockwise direction and employing a right hand worm 106, the gear 102 will move clockwise when viewed in plan, and gear 100 will move counterclockwise when viewed in plan. Thus, as seen in Fig. 6, when the gear 102 is engaged with the rack 82, the rack will move to the right, when the gear 100 is engaged with the rack 82, the rack will move to the left.

A sensing device, generally designated by the reference numeral 112, is disposed along the path of travel of the side edges s_1 , s_2 for sensing deviations of the folded over side edge s_2 beyond established limits in relation to the prescribed feed path for the edges toward the tube-forming apparatus. The sensing device 112 in turn controls the direction and period of drive to the rack 82 such that the folded over side edge s_2 may be restored to the established limits after deviating therefrom. The oriented position for the side edges s_1 , s_2 , which should be in substantial registry, is in alignment with the cutting blade of the tube-forming apparatus. The sensing device 112 includes an actuator 114 which lies along the prescribed path for the side edge s_2 in relation to the tube forming apparatus. The details of the sensing device are shown in Fig. 7, and are seen to include a pair of switches 116, 118, both operated by the common actuator 114. The switch 116 is biased to be in a normally closed position, while the switch 118 is biased to be in a normally open position. In the illustrative showing of Fig. 7, both switches are seen to be open, corresponding to operation wherein the folded over side edge s_2 is along the prescribed path or within the established limits.

The sensing device 112 controls the energization of pull-type solenoids 120, 122. The pull-type solenoids 120, 122 have their actuators 120a, 122a connected to the sleeve 124 on the stud 96. Thus, upon energization of the pull-type solenoid 120, it will be appreciated that the gear 100 is brought into mesh with the rack 82; while upon energization of the solenoid 122 the gear 102 will be brought into mesh with the rack 82. Referring again to Fig. 7, the solenoids 120, 122 are energized from an appropriate alternating current source via leads 125, 126 and 130. The lead 125 constitutes a common ground while the lead 126 via the switch 116 completes the energization circuit for the solenoid 120 and the lead 130 via the switch 118 completes the energization circuit for the solenoid 122. Thus, it will be appreciated that as the side edge s_2 travels inwardly corresponding to widening of the goods, the switch 118 will be closed, bringing the gear 102 into mesh with the rack 82 to displace the doubling frame 56 outwardly in relation to the reference side edge s_1 . Similarly, if the width of the material becomes too narrow, the switch 116 closes,

bringing the gear 100 into mesh with the rack 82 and displaces the doubling frame inwardly toward the reference side edge s_1 . The deviation of the folded over side edge s_2 from the prescribed path defined by the reference side edge s_1 will, of course, be determined by the position at which the respective switches 116, 118 are closed. Any appropriate mechanisms may be provided for adjusting the position at which the switches are closed to give a wide or narrow range of permissible deviation of the folded over side edge s_2 in relation to the reference. Although the illustrative form of the invention shows mechanical sensing of the folded over side edge s_2 , it is to be expressly understood that the use of equivalent sensing devices, such as photoelectric cells, are equally within the contemplation of this disclosure.

Contiguous to the rear end of the support or base is a material supporting means; in this form of the invention this means is illustrated as a core bar 132 journaled on bearings 134, 136 for rotation and slidable from side to side in said bearings. On the core bar 132 are a pair of adjustable chucks 138, 140 which may be disposed within opposite ends of a drum supporting a roll of goods, as shown by the broken lines of Fig. 2, to locate the roll with the referenced side edge s_1 lying along the prescribed feed path. As seen in Figs. 1 and 2, the assembly of the core bar 132, may be removed from its support to receive the roll of goods thereon.

Actuating mechanisms are provided for displacing the core bar 132 from side to side, such that the reference side edge s_1 remains along the prescribed feed path. The actuating mechanisms include a rocking lever 142 pivoted on a bracket 144 on the base, the lever having a bifurcated end in operative engagement with a collar 146 on the core bar 132 outward of the chuck 138. The lever 142 is connected to a rack 148 by a pin and slot connection, the rack in turn being supported for sliding movement along a line parallel to the path of sliding movement of the core bar 132 by appropriate bearing openings in the uprights 52, 54.

As seen in Fig. 1, a further sensing device 112' having an actuator 114' is supported from the upright 52. The actuator 114' of the sensing device, as seen in Fig. 5, is in position to contact the reference side edge s_1 and includes a pair of switches, one of which is closed in response to movement of the reference side edge s_1 out of the prescribed feed path in one direction, and the other of which is closed in response to movement of the reference side edge s_1 out of the prescribed feed path in the opposite direction. The rack 148 is alternately engaged by gears 100', 102' driven by a screw 106' from a motor 108' via a pulley coupling 110'. The sensing device 112' for the reference side edge s_1 is coordinated to the gears 100', 102' as was described in conjunction with the sensing device 112 for the folded over side edge s_2 . Accordingly, detailed description of this lateral-shift control would be repetitive; it suffices for the present purposes to point out that the core bar 132 is adjusted side to side in response to variations in positions of the reference side edge s_1 outside of permissible limits of deviation. Thus, after the reference side edge s_1 of the material in roll form is initially adjusted by locating the chucks 138, 140, the mechanism controlled by the sensing device 112' continues to maintain the reference side edge s_1 in the adjusted position.

Although the material-supporting means has been illustrated as a core bar and associated structure for handling goods in roll form, it is equally within the contemplation of the invention to employ material-supporting means for delivering goods from a flat folded condition. In this situation, the structure equivalent to the core bar 132 is a serrated tube with guided flanges for movement from side to side as the goods passes over it under control of an appropriately placed sensing device. In this illustrative embodiment, a table for the flat folded goods could be placed in advance of the core bar 132

and the serrated tube mounted on the core bar 132. Accordingly, in the appended claims, the expression "material-supporting means" and equivalent terminology should be construed consistent with feed from the roll form as well as from flat folded condition.

A typical sequence of operation will now be described in detail to facilitate a more thorough understanding of the present invention:

The goods in roll form is initially supported on the core bar 132, oriented and thereafter threaded through the material doubling mechanisms 50. The threading path, illustrated in Fig. 5, is seen to include passage of the goods around the idler roller 58, reverse travel and passage of the goods about the doubling bar 60, about the angular doubling bar 64, feed of the folded over half section about the angular doubling bar 62 and delivery of the half sections through the pretensioning bars to the tube-forming apparatus. The sensing devices 112, 112' each of which may be mounted on an adjustable support, are disposed such that their respective actuators 114, 114' lie along the prescribed feed path for delivery of the edges s_1 , s_2 to the tube-forming apparatus; that is, with the goods positioned such that the stitching apparatus is operative and the cutting knife removes a very small amount of goods outwardly of the stitch line. In this adjusted position, the switches 116, 118 associated with both sensing devices 112, 112' will be in open position. As is understood, that hand wheel 90 may be employed to manually adjust the doubling frame 56 such that the apex of the doubling frame lies substantially along the longitudinal center line of the material M along which the fold f is to be formed.

Operation is then initiated by rendering the tube-forming apparatus 10 operative which pulls the material from the supply through the doubling unit about the pretensioning bars and through the stitching and seam opening mechanisms.

As the roll diminishes, it is not uncommon for the side edge s_1 to be displaced inwardly as when the end face of the roll has a somewhat conical depression. When the inward displacement of the edge s_1 exceeds the permissible inner limit determined by the throw of the appropriate switch (in this instance 116), the switch is closed to cause the core bar 132 to be laterally shifted in an amount sufficient to restore the edge to the position wherein the actuator 114' maintains both switches in their respective open positions.

Concurrently, or at another time in the cycle, the width of the goods may increase or decrease as previously detailed, and the appropriate one of the switches 116, 118 is closed to effect the necessary lateral displacement of the doubling frame 56.

It will be appreciated from an inspection of Figs. 1 to 3 inclusive, that the doubling mechanisms are rather compact, and thus may be readily disposed in front of the tube-forming apparatus 10.

Further, it is comparatively easy to place the goods in roll form on the core bar 132 or in the alternative on the flat fold table disposed in advance of the doubling mechanisms 50.

Practical experience indicates that the travel of the goods through the doubling unit 50 does not effect proper tandem feed of the superposed layers m_1 , m_2 to the pretensioning bars. To elaborate, it is known in a conventional sewing machine employing a bottom feed dog that there is a tendency for the lower layer of the material to be advanced past the needle more rapidly than the upper layer due to the holding back effect of the presser foot and the action of the feed dog. The pretensioning bars employed in conjunction with the sewing apparatus substantially eliminates this creep and precludes the necessity of having the operator hold back the under layer to assure tandem feed. As seen in Fig. 5, the instant doubling unit 50, after the material is brought into superposed relation, does not change with the direction of travel of the

goods or act on one of the layers to the exclusion of the other of the layers such as to cause relative motion of one of the layers with respect to the other layer. Thus, the doubling unit is compatible with required operating conditions for the tube-forming apparatus.

From the foregoing, it will be further appreciated that the doubling unit allows for the maximum utilization of the width of the goods consistent with obtaining the required stitch line and the required margin outwardly of the stitch line. Thus, for wider widths of goods than the average width, the doubling unit automatically moves outwardly with respect to the reference line or plane such that the maximum width of the stitched tube may be obtained for the material; conversely, if the goods narrows down, the stitching unit still operates and the doubling unit shifts the feed to a location wherein the tube-forming apparatus operates properly.

Although there has been described an excellent embodiment of the present invention, a range of alternative modifications, omissions and additions will be readily apparent to those skilled in the art; in certain instances certain features of the invention will be used without a corresponding use of other features.

What I claim is:

1. In combination with a sewing machine including a needle movable through a stitch forming stroke and a feed dog movable through a feed stroke, said needle being operative along a predetermined path to form a seam in a folded length of material spaced inwardly of the side edges thereof, and doubling means in advance of said sewing machine for delivering said material to said sewing machine folded about a longitudinal median line with the opposite side edges in substantial registry and along a reference line which is fixed in relation to said predetermined path, said doubling means including a first doubling member extending at right angles to said predetermined path in a first plane and including one end terminating substantially along the longitudinal center line of said doubling means, second and third angularly disposed doubling members disposed in a second plane substantially parallel to said first plane and arranged symmetrically of said center line, said second and third doubling members meeting at an apex at said one end of said first doubling member and having material-turning edges at right angles to each other, and a fourth doubling member disposed substantially in said first plane and having a material-turning edge lying substantially along said center line.

2. In combination with means operating along a predetermined path for forming and opening a stitched seam at one side of a folded length of material having a reference edge and a folded over edge, material doubling means for folding said material longitudinally in half about a longitudinal median line to bring the folded over side edge into substantial registry with the reference side edge, said means including a support, a doubling frame for folding said material about said median line, means on said support and operatively connected to and mounting said doubling frame for side to side adjustment whereby the registering edges of said material may be brought into an oriented position relative to said predetermined path, means along the path of travel of said registering side edges for sensing deviations of said folded over side edge beyond established limits from said oriented position, and adjusting means operatively connected to said doubling frame and operative under control of said sensing means to shift said doubling frame side to side for maintaining said folded over side edge within said established limits.

3. Material doubling means adapted for use with sewing mechanisms operative along a predetermined path for forming and opening a stitched seam at one side of a folded length of material having a reference side edge and a folded over side edge, said material doubling means being arranged to fold said material longitudinally in half

about a longitudinal median line to bring the folded over side edge into substantial registry with the reference side edge, said material doubling means including a support, a doubling frame for folding said material about said median line, means on said support and operatively connected to and mounting said doubling frame for side to side adjustment whereby the registering edges of said material may be brought into an oriented position relative to said predetermined path, means along the path of travel of said registering side edges for sensing deviations of said folded over side edge beyond established limits from said oriented position, and adjusting means operatively connected to said doubling frame and operative under control of said sensing means to shift said doubling frame side to side for maintaining said folded over side edge within said established limits.

4. In combination with means operating along a predetermined path for forming and opening a stitched seam at one side of a folded length of material having a reference side edge and a folded over side edge, material doubling means for folding said material longitudinally in half about a longitudinal median line to bring the folded over side edge into substantial registry with the reference side edge, said means including material supporting means, means operatively connected to and mounting said material supporting means for side to side adjustment whereby the reference side edge of said material may be brought into an oriented position relative to said predetermined path, means along the path of travel of said reference side edge for sensing deviations of said reference side edge beyond established limits from said oriented position, adjusting means operatively connected to said material supporting means and under control of said sensing means for maintaining said reference side edge within said established limits, a support, a doubling frame for folding said material about said median line, means on said support and operatively connected to and mounting said doubling frame for side to side adjustment whereby the registering edges of said material may be brought into said oriented position relative to said predetermined path, further means along the path of travel of said registering side edges for sensing deviations of said folded over side edge beyond established limits from said oriented position, and adjusting means operatively connected to said doubling frame and operative under control of said further sensing means to shift said doubling frame side to side for maintaining said folded over side edge within said established limits.

5. Material doubling means adapted for use with sewing mechanisms operative along a predetermined path for forming and opening a stitched seam at one side of a folded length of material having a reference side edge and a folded over side edge, said material doubling means being arranged to fold said material longitudinally in half about a longitudinal median line to bring the folded over side edge into substantial registry with the reference side edge, said material doubling means including material supporting means, means operatively connected to and mounting said material supporting means for side to side adjustment whereby the reference side edge of said material may be brought into an oriented position relative to said predetermined path, means along the path of travel of said reference side edge for sensing deviations of said reference side edge beyond established limits from said oriented position, adjusting means operatively connected to said material supporting means and under control of said sensing means for maintaining said reference side edge within said established limits, a support, a doubling frame for folding said material about said median line, means on said support and operatively connected to and mounting said doubling frame for side to side adjustment whereby the registering edges of said material may be brought into said oriented position relative to said predetermined path, further means along the path of travel of said registering side edges for sensing

deviations of said folded over side edge beyond established limits from said oriented position, and adjusting means operatively connected to said doubling frame and operative under control of said further sensing means to shift said doubling frame side to side for maintaining said folded over side edge within said established limits.

6. In combination with a sewing machine including a needle movable through a stitch forming stroke and a feed dog movable through a feed stroke, said needle being operative along a stitching path to form a seam in a folded length of material spaced inwardly of the side edges thereof, shiftable feed means for said material, laterally-shiftable doubling means including a doubling frame for delivering said material to said sewing machine folded about a longitudinal median line with the opposite side edges in substantial registry and along a reference line which is fixed in relation to said stitching path, first sensing means arranged along the path of travel of one side edge of said material for sensing deviations of said one side edge from said reference line, second sensing means arranged along the path of travel of the other side edge of said material for sensing deviations of said other side edge, means responsive to said first sensing means for laterally shifting said feed means, and means responsive to said second sensing means for shifting said doubling frame.

7. The combination according to claim 6 wherein at least one of said sensing means includes a first switch which is normally closed, a second switch which is normally open, and a common actuator movable in one direction for controlling said switches, said actuator in response to a predetermined thrust opening said first switch and allowing said second switch to remain open, said actuator in response to further thrust in said one direction closing said second switch and maintaining said first switch in open position.

8. In combination with a sewing machine including a needle movable through a stitch forming stroke and a feed dog movable through a feed stroke, said needle being operative along a stitching path to form a seam in a folded length of material spaced inwardly of the side edges thereof, laterally-shiftable feed means for said material, laterally-shiftable doubling means including a doubling frame for delivering said material to said sewing machine folded about a longitudinal median line with the opposite side edges in substantial registry and along a reference line which is fixed in relation to said stitching path, first sensing means arranged along the path of travel of one side edge of said material in advance of said doubling frame for sensing deviations of said one side edge from said reference line, second sensing means arranged along the path of travel of the other side edge of said material following said doubling frame for sensing deviations of said other side edge when folded over, means responsive to said first sensing means for laterally shifting said feed means, and means responsive to said second sensing means for shifting said doubling frame.

9. A material feeding and doubling device for use with a sewing machine including a needle operative along a stitching path to form a seam in a folded length of material spaced inwardly of the side edges thereof comprising laterally-shiftable feed means for said material, laterally-shiftable doubling means including a doubling frame for delivering said material to said sewing machine folded about a longitudinal median line with the opposite side edges in substantial registry and along a reference line which is fixed in relation to said stitching path, first sensing means arranged along the path of travel of one side edge of said material in advance of said doubling frame for sensing deviations of said one side edge from said reference line, second sensing means arranged along the path of travel of the side edge of said material following said doubling frame for sensing deviations of said other side edge when folded over, means responsive to said first sensing means for laterally shifting said feed

means, and means responsive to said second sensing means for shifting said doubling frame.

10. In combination with means operating along a predetermined path for forming and opening a stitched seam at one side of a folded length of material having first and second side edges, material-doubling means for folding said material longitudinally in half about a longitudinal median line to bring said side edges into substantial registry, said means including material-supporting means mounted for side to side adjustment, first sensing means along the path of travel of said first side edge for tracking deviations of said first side edge, adjusting means operatively connected to said material-supporting means and under control of said first sensing means for effecting side to side adjustment of said material-supporting means, a support, a doubling frame for folding said material about said median line, means on said support and operatively connected to and mounting said doubling frame for side to side adjustment, second sensing means along the path of travel of said second side edge for tracking deviations of said second side edge, and adjusting means operatively connected to said doubling frame and operative under control of said second sensing means for effecting side to side adjustment of said doubling frame.

11. In combination with a sewing machine including a needle movable through a stitch forming stroke and a feed dog movable through a feed stroke, said needle being operative along a predetermined path to form a seam in a folded length of material spaced inwardly of the side edges thereof, pretensioning means in advance of said sewing machine including several pretensioning bars extending at right angles to said predetermined path, doubling means in advance of said pretensioning means for delivering said material to said pretensioning means folded about a longitudinal median line with the opposite side edge in substantial registry, said doubling means in-

cluding an idler roller in advance of and parallel to said pretensioning bars and a doubling frame having a first doubling member disposed in a first plane in advance of and parallel to said idler roller and including one end terminating substantially along the longitudinal center line of said doubling means, second and third angularly disposed doubling members disposed in a second plane substantially parallel to said first plane and arranged symmetrically of said center line, said second and third doubling members meeting at an apex at said one end of said first doubling member and having material-turning edges at right angles to each other, and a fourth doubling member disposed substantially in said first plane and having a material-turning edge lying substantially along said center line, and means mounting said doubling frame for lateral shifting in relation to said sewing machine.

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