United States Patent [19]

Diacont, Jr. et al.

[11] **3,924,785**

[45] **Dec. 9, 1975**

[54] **HEM FORMING APPARATUS**

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[21] Appl. No.: **524,175**

[52] **U.S. Cl.** ..... **223/2**; 33/2 H

[51] **Int. Cl.**[2] **A41H 43/00**

[58] **Field of Search** ..... 33/2 H, 2 R; 223/2, 39–43, 223/37

[56] **References Cited**

UNITED STATES PATENTS

2,249,968	7/1941	McDonald	223/2
2,737,320	3/1956	Bowler	223/2
2,863,591	12/1958	Butler	223/2
2,879,926	3/1959	Newton	223/2
3,257,663	6/1966	Williamson	223/2
3,779,432	12/1973	Fukuta et al.	223/39

Primary Examiner—Geo. V. Larkin

Attorney, Agent, or Firm—George W. Price; Martin Smolowitz

[57] **ABSTRACT**

An apparatus for forming a hem upon a tubular section of material employing a pair of pivotable elongated members which are programmed to move within a prescribed arcuate path after the material to be formed is inserted within a prescribed clearance space formed by the elongated members and movable sleeves.

9 Claims, 6 Drawing Figures

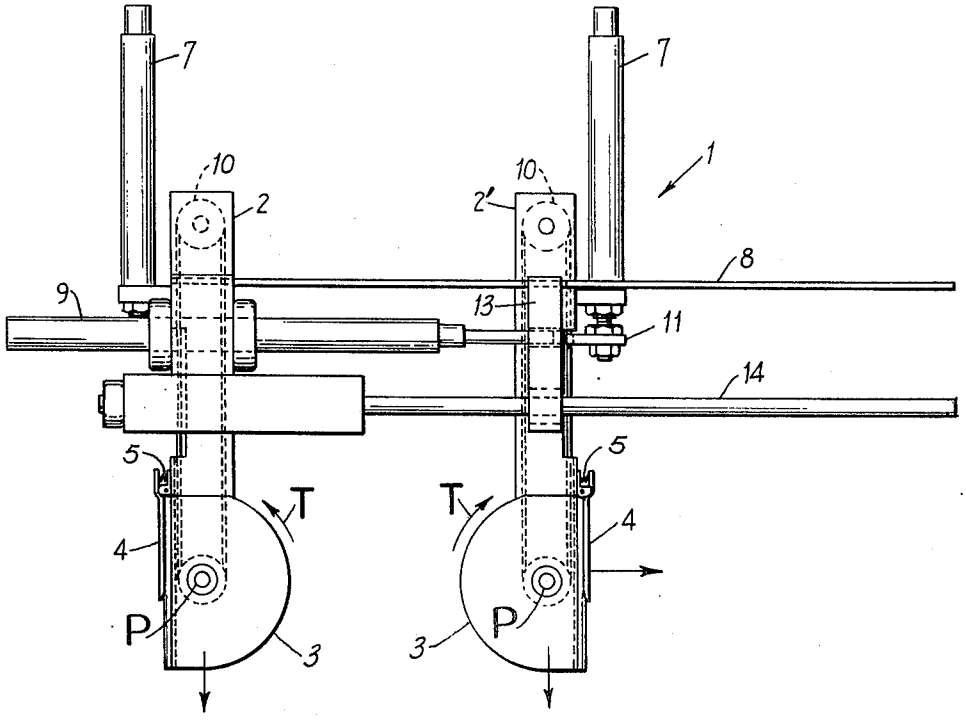


FIG. 1a

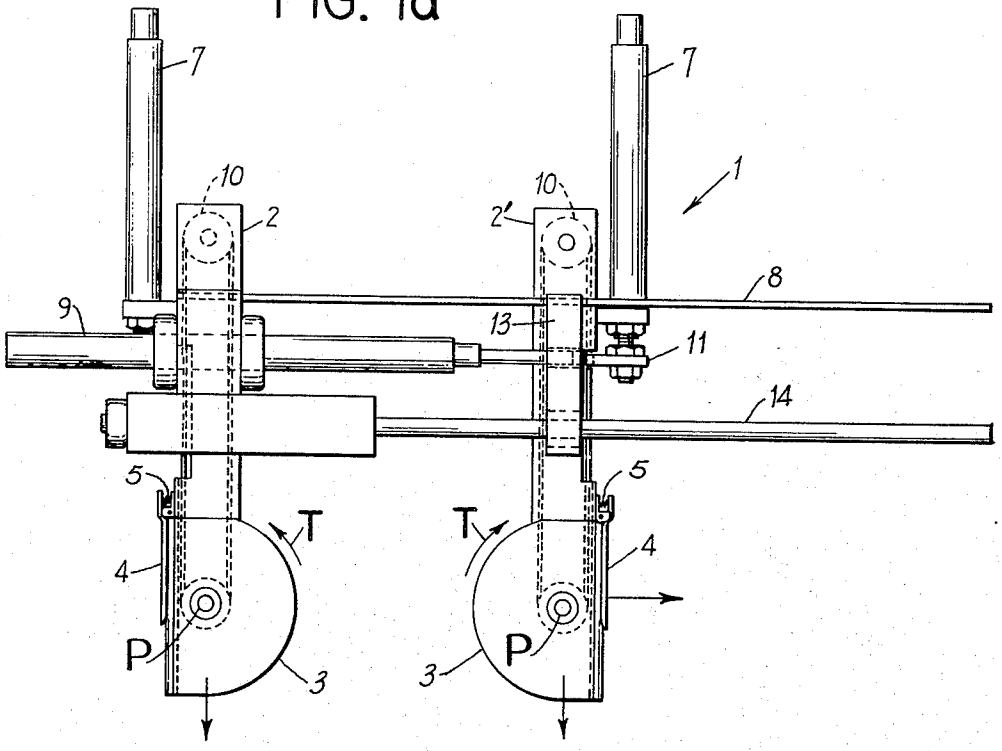


FIG. 1b

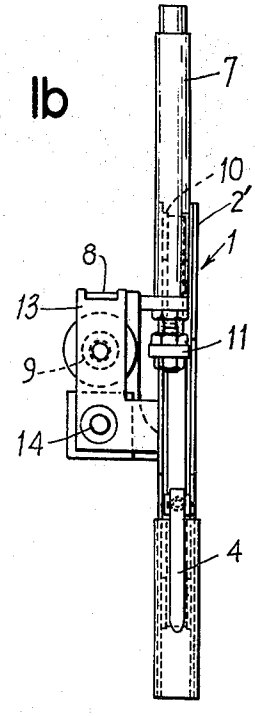


FIG. 2

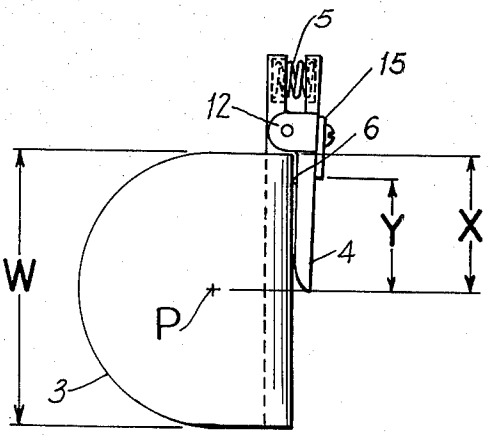


FIG. 3a

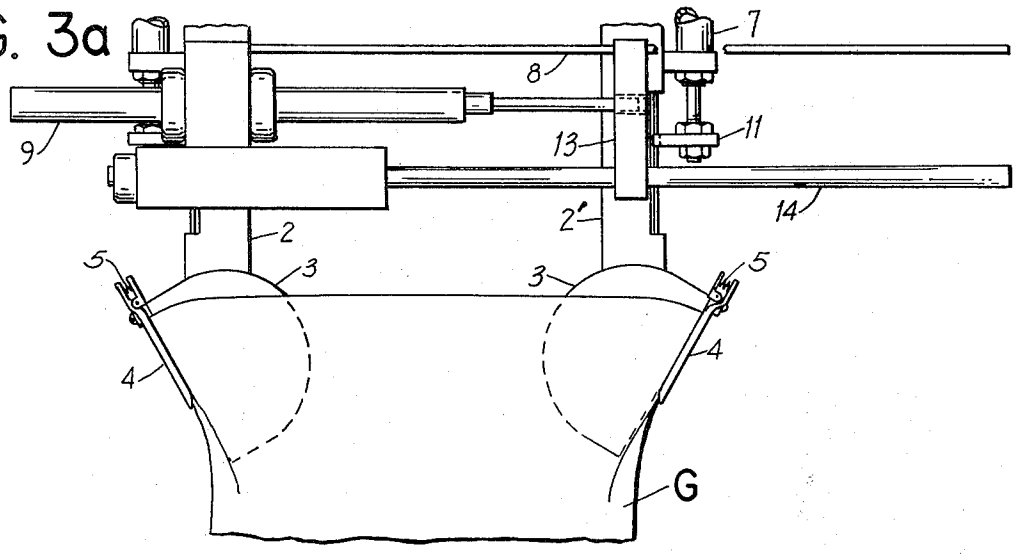


FIG. 3b

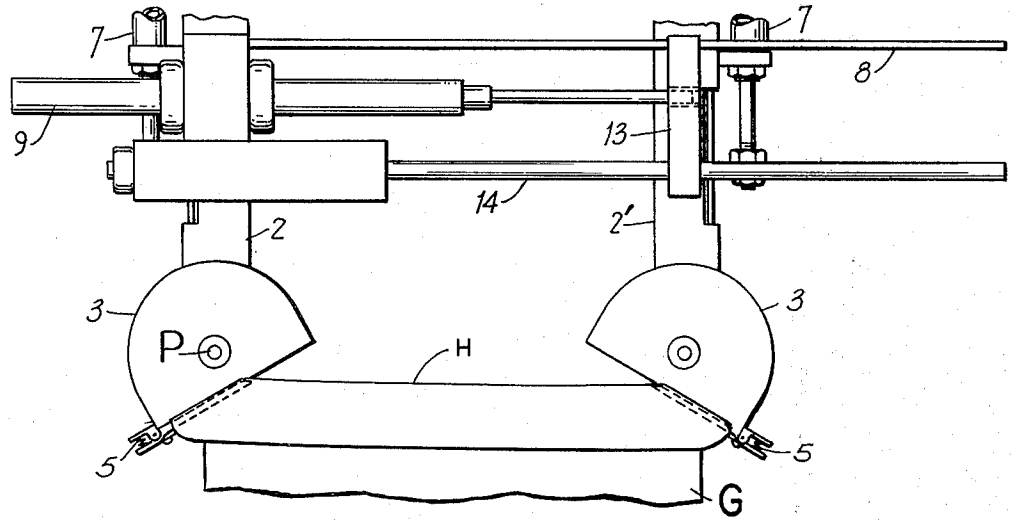
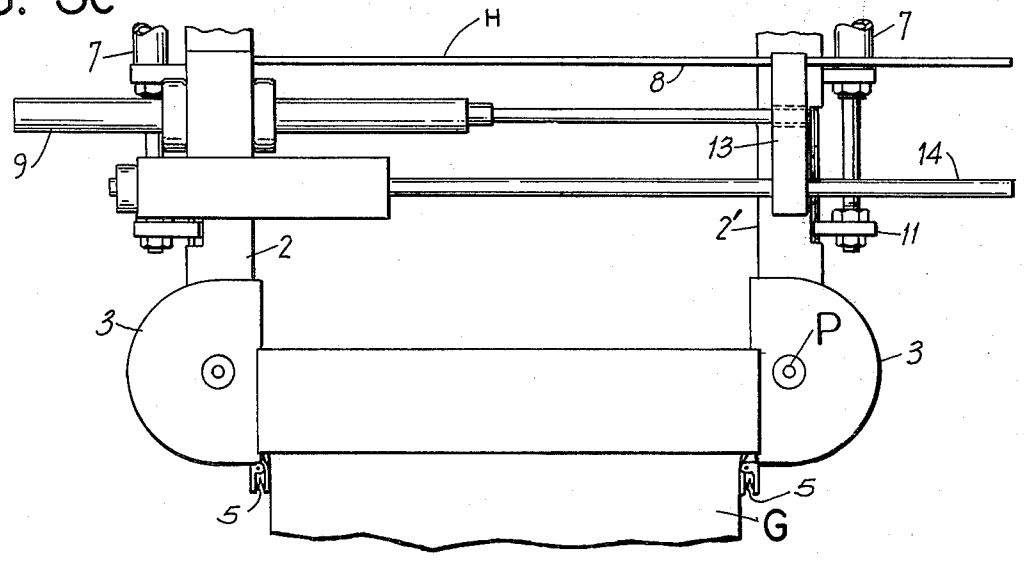


FIG. 3c



HEM FORMING APPARATUS

The present invention is directed to an apparatus for the formation of a hem or seam or the like on garments. More particularly, the present invention is directed to an apparatus for producing a hem on a tubularly shaped section of a garment by engaging and folding the end portion of the tubularly shaped portion in a preselected manner.

Because of the high cost of labor as an essential factor in the manufacture of garments and the like, industry has sought ways and means for minimizing the need for hand operations. Traditionally, the steps concerned with producing a cuff on a trouser leg or a hem on a dress has been carried out as a purely manual operation, namely a machine operator would physically grasp the garment or section of the garment and bend over an end portion for a prescribed distance. Obviously, such operation is time consuming, not absolutely accurate and costly.

Certain attempts to mechanize this function have met with a measure of success. However, the complexity of necessary equipment, as well as expertise required in setting-up such equipment has left something to be desired in this respect.

Accordingly, the present invention has sought to define the overall operation by including a manual feeding and positioning step together with a series of subsequent mechanical operations to achieve a desired hem. By incorporating a number of new and novel design features in the present invention, repeatability and success of operation over a long span of time is virtually assured.

Applicants have considered a number of prior art patents in the course of developing the present invention and for the aforementioned reasons have found such devices to lack the benefits and features to be found in the present invention. For an example, U.S. Pat. No. 2,737,320 (Bowler), relates to a device for forming trouser cuffs employing a pair of guides which engage the inner surfaces of the tubular garment portion to be worked and only move inside such tubular portion so as to extend such engaged surfaces i.e. stretch the ends of trouser legs to their fullest. Such arms, in turn, are caused to cooperate with a pair of bars that are drawn and aligned with the arms to loop the fabric into a cuff. In effect, by this arrangement, the arms remain virtually stationary and the bars outside of the trouser leg act upon the portion to be formed into a cuff. What is absent is the degree of control and rapidity of operation as with the present invention.

In addition, several other patents, i.e. U.S. Pat. Nos. 2,863,561 and 2,879,962 illustrate devices employing arms which are moved into the end of the trouser leg and move laterally to stretch the leg. However, in both of these instances, the actual cuff is formed manually by turning the material over by hand.

Lastly, Applicants have considered a number of patents (of which U.S. Pat. No. 3,603,488 is representative) where the operative arms enter into the tubular garment section and are caused to turn about an axis of the product. However, merely pivoting to open the end of a product, such as a bag, does not contemplate an operation in which a cuff is formed in a manner as set forth hereinafter.

Accordingly, it is the main object of the present invention to overcome the defects of the prior art.

It is still a further object of the present invention to provide an apparatus capable of being programmed to form a cuff or hem of a desired length.

Still another object of the present invention is to provide an apparatus for manufacturing a hem on a tubular section with the minimum of manual operations.

Yet a further object of the present invention is to provide a device for mechanically forming a cuff on a trouser leg on a predefined length in which means are provided to control the manner in which the cuff is formed.

The principal features of the invention are directed to an automatic apparatus for forming an overlay of material the nature of a hem, upon a tubular section of material positioned in said apparatus, including: a pair of parallel disposed arms mounted on ways, each of said respective arms being further provided with pivotally mounted sleeve members integrally formed therewith; material engagement means connected to each of said sleeves and spaced apart therefrom to form a clearance space therebetween for inserting said tubular material into such space; stop means provided on each of said arms for adjusting the length of said clearance space; and prime mover means connected to said arms for laterally moving said arms on said ways.

Also within the scope of the present invention is an apparatus where each said material engagement means are generally elongated, provided with tapering sides; said engagement means being adapted to urge the material within said clearance to retain a given position as said engagement means pivotally move in concert with said sleeve members for a maximum pivotal range of up to 180 arcuate degrees.

Still other objects and advantages in the present invention will be obvious once the specification and drawings are studied with respect to the appended claims.

IN THE DRAWINGS

FIG. 1*a* is a plan view of the present invention.

FIG. 1*b* is a side view of the invention shown in FIG. 1*a*.

FIG. 2 is a partial enlarged plan view of the invention as shown in FIG. 1*a*.

FIGS. 3*a*, *b*, *c* are partial plan views respectively of the invention at different positions during its operating cycle.

In accordance with FIG. 1*a*, the device 1 of the present invention may be employed individually as a separate module or in combination with another device in the overall manufacture of a garment such as a pair of trousers, dresses, sleeves, etc. The present invention basically consists of a pair of symetrical arms **2, 2'** which are positionable on ways **14** and are in spaced apart relationship with respect to one another. Arm **2** is stationary and arm **2'** is movable in a manner to be described hereinafter. Prior to initiating the manufacturing operation, as will be explained, the distance between arms **2, 2'** is determined and the relationship between such arms **2, 2'** is fixed for a given operation. Each arm **2, 2'**, in turn, is provided with a relatively flat elongated member having associated therewith a rotatable radial sleeve **3** which is pivotable about a point P certain on such arms **2, 2'**. In turn, the sleeve **3** is provided with an associated elongated gripper **4**. The gripper **4** is attached to the sleeve **3**, is spring loaded i.e. **5**, and is caused to move in concert therewith as it pivots about the arms **2, 2'** in a pre-select manner. The grip-

per 4 is laterally disposed of the sleeve 3 to provide a clearance space 6 of a desired thickness to allow the tubular garmet G to be inserted therein. The length X of such clearance space 6 (see FIG. 2) is determined by an adjustment of the gripper member at 15. The gripping members 4 are so positioned as to move in a direction perpendicular to the axis of the tubular product being worked upon (see FIG. 1*a*), such that during the actual turning operation (see FIGS. 3*a*, *b*, *c*) such grippers 4 are caused to turn in a direction T up to 180° about the axis located at the corners of the stretched out tubular product or garment G. Once this occurs, the hem or cuff H is formed (see FIGS. 3*b* and *c*).

As in FIG. 3*a*, during operation, the arms 2, 2′ containing the sleeve-gripper members 3, 4 are disposed close enough together to allow the tubular member G to be inserted in the entrance way or clearance 6 between each respective gripper 4 and sleeve 3. Thereafter, the tubular product G is stretched, (FIGS. 3*b*, 3*c*) under the pneumatic action of piston 9 connected through linkage block 13 to one of the arms (movable arm) 2′. Thus, the movable arm 2′ is caused to move apart in the lateral direction (FIGS. 3*a*, *b*, *c*). Simultaneously therewith, the sleeve-gripper 3, 4 assembly is caused to pivot about the respective arms 2, 2′ in an outward direction 180° apart through the action of pistons 7. The pivoting motion is carried out via pulley system 10 acting under the influence of pistons 7 through associated clamps 11. Simultaneously therewith the pneumatic action of piston 9 extends the movable arm 2′ for a distance equal to that required for the material to be formed into a cuff. Throughout this operation the material G is held taut by the clips 4 and the lateral position of the arms 2, 2′.

As mentioned above, the actual operation on the tubular section G to be hemmed is carried out pneumatically; through the action of pistons 7, 9 which are programmed to operate in a five step cycle. Initially, a principle piston 9 is in the retracted position, FIG. 3*a*, enabling the tubular section to be worked upon to be loaded into the apparatus 1. Stabilizing bar 8 mounted on stationary arm 2 (in a manner not shown) provides rigidity to moving arm 2′. The arms 2, 2′ for receiving the garment section G are relatively close together and the tubular section sags in the opening formed between such arms. Next, FIG. 3*b*, the principle piston 9 is actuated and causes the arm 2′ to extend and take up excessive sag or looseness in the tubular section, FIG. 3*b*. Lateral movement of the arm 2′ takes place through the actuation of the piston 9 in a plane of the movement of the tubular section G to be worked upon. The piston pressure for this step of the operation is maintained as light as possible.

Thereafter, two separate pistons 7, each of which operates the respective arms 2, 2′ of the device during the hem forming operation, are caused to function. These pistons 7 extend in a line parallel to the arms 2, 2′ and initate the tubular section G bending for hemming action by causing pivoting to take place on the arms 2, 2′. The principle piston 9 governing the translatory motion of the arm 2′ retracts by pressure of the tubular section G only. Next the respective pistons 7 operating each of the arms 2,2′ continue to drive the pivot members 3,4 of such arms 2,2′ about the pivot point P causing the tubular section G to turn 180°, FIG. 3*b*, 3*c*. At this point in time, the principle piston 9 is extended to its full position. Lastly, when the cuff or hem is completely formed on the tubular section G, the principle piston 9 is completely extended and the tubular section G has been formed.

In carrying out the aforementioned operation pneumatically, it may be required to employ air accumulator tanks or pressure relief valves (not shown) on both the input and output ports of the principle piston 9 to maintain pressure control.

The above operation can likewise be programmed to function by purely mechanical means, such as with appropriate spring loading and properly contoured cams.

The interrelationship of the sleeve 4, pivot point P and gripper 4 may be best understood with reference to FIG. 2. In this connection it is to be noted that the linear distance Y represents the distance or length of cuff or hem to be formed by turning that amount of material on itself. X represents the maximum adjustable distance of the clearance 6 between the gripper 4 and the sleeve 3 for forming a hem or cuff. This distance is measured along the longitudinal axis forming a pivot point P to a stop 12 on the gripper 4. This stop 12 is adjustable within the relationship of a distance from the pivot point P enabling the sleeve 3 and gripper 4 to pivot and thereby fold the material G with respect to an overall distance W. This distance or dimension W is usually held to an amount equal to twice the length or distance of X. In other words, the total length of the sleeve of which one half represents the cuff width can not exceed twice the maximum length of the cuff since the distance required for proper pivoting will not justify a relationship in excess of the aforementioned amount.

Once the grippers 4 engage the section of tubular material G to be turned, and are pivoted for 180°, the cuff is formed and the section of material is then ready for treatment at another station. The section of material is caused to be disengaged from the apparatus by indexing such arms closer together and creating a slack in the section just formed. The operator next manually removes the cuff section and thereafter the gripper-sleeve 3, 4 arrangement is caused to pivot on the arms 2 such that the apparatus assumes a start position for a fresh operation. In so doing, the gripper-sleeve elements are each caused to assume an out-board position (FIG. 1*a*).

Obviously, by altering the size and pivot points P of the respective elements in the apparatus, it becomes possible to vary this size tubular section to be turned. Furthermore, within a given range of distance it is possible to work upon different classes of materials to be cuffed or hemmed.

It is of noteworthy significance that the unique disposition of the pivot points P enables the apparatus to work within a limited space, within a minimum number of parts with a resultant lower unit cost. More specifically, the pivot points P during the operating cycle of the apparatus 1 are on the inside of the tubular section G which allows for the above mentioned advantages.

What is claimed:

1. An apparatus for forming an overlay of material in the nature of a hem, upon a tubular section of material positioned in said apparatus, including: an apparatus super-structure; ways attached to said super-structure; a pair of parallel disposed arms mounted on said ways, each of said respective arms being provided with pivotally mounted sleeve members integrally formed therewith; material engagement means connected to each of said sleeves and spaced apart therefrom to form a clearance space therebetween for inserting said tubular material into such space; stop means provided on each

of said arms for adjusting the length of said clearance space; and prime mover means connected to said arms for laterally moving said arms on said ways.

2. An apparatus as claimed in claim **1**, wherein: individual prime mover means are each connected to said sleeves for programming the pivoting motion of each of said sleeves.

3. An apparatus as claimed in claim **1**, wherein: each said material engagement means are generally elongated and provided with tapering sides; said engagement means being adapted to urge the material within said clearance to retain a given position as said engagement means pivotally move in concert with said sleeve members for a maximum pivotal range of up to 180 arcuate degrees.

4. An apparatus as claimed in claim **1**, wherein:

each of said respective sleeve members move about pivot points on said arms disposed at points equal to onehalf the maximum clearance distance space formed between said material engagement means and said sleeves.

5. An apparatus as claimed in claim **1**, wherein:

a slidably adjustable stop member traverses said clearance space to determine the amount of overlay material to be formed.

6. An apparatus as claimed in claim **1**, wherein:

each of said prime mover means is defined by an pneumatically actuated piston and cylinder arrangement.

7. An apparatus as claimed in claim **1**, wherein:

said members for engaging the material are adapted to move in a direction perpendicular to the axis of the ways.

8. An apparatus as claimed in claim **1**, wherein:

the lateral distance between each of said arms is greater during the hem forming operation as compared to the initial tubular material loading operation to thusly cause such material to become taut by the movement of said arms on said ways.

9. An apparatus as claimed in claim **1**, wherein:

said respective sleeve members have their pivot points located inside of said tubular material during loading of said material into said engagement means.

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