United States Patent [19]

Friedman et al.

[11] **3,792,672**

[45] **Feb. 19, 1974**

[54] **APPARATUS FOR CUTTING, FOLDING AND ATTACHING TABS OF FLEXIBLE RIBBON-LIKE MATERIAL**

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[22] Filed: **June 29, 1971**

[21] Appl. No.: **157,963**

[52] **U.S. Cl.** ..... **112/104,** 93/1 E, 112/121.26, 112/152, 223/37

[51] **Int. Cl.** **D05b 3/20**

[58] **Field of Search** ... 112/136, 137, 151, 152, 142, 112/121.27, 130, 104, 121.26; 93/1 E, 35 H; 223/37

[56] **References Cited**

UNITED STATES PATENTS

2,450,663	10/1948	Horwath	112/137
1,560,219	11/1925	Cunningham	112/137
2,730,976	1/1956	Loden	112/151
2,862,467	12/1958	Passaro et al.	112/152
3,426,708	2/1969	Andersson	112/121.26

Primary Examiner—H. Hampton Hunter

[57] ABSTRACT

Methods and Apparatus for automatically advancing a length of ribbon from a roll, severing a desired length therefrom, turning the ends inwardly towards the center, folding the length generally centrally to position the cut ends generally adjacent within the central fold, positioning the double folded length to cover the end of a garment seam and stitching the resultant seam end cover to the garment.

26 Claims, 8 Drawing Figures

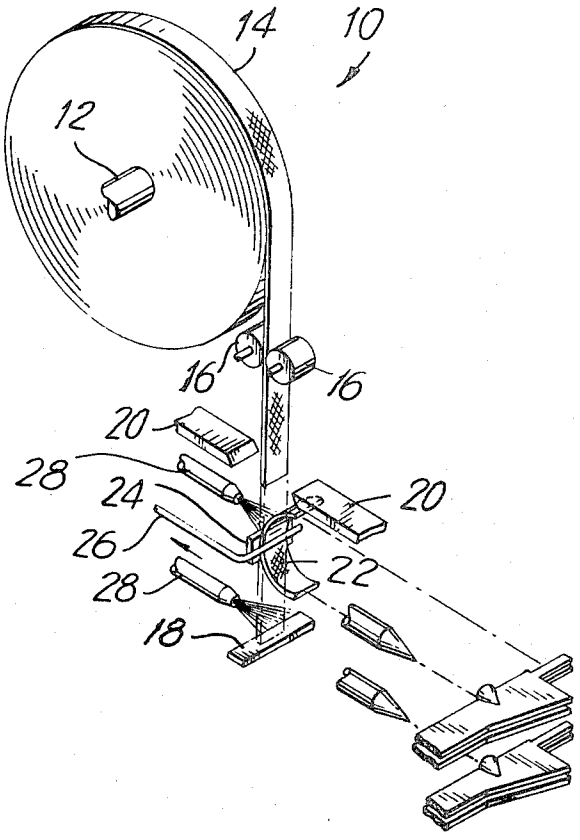


FIG. 1

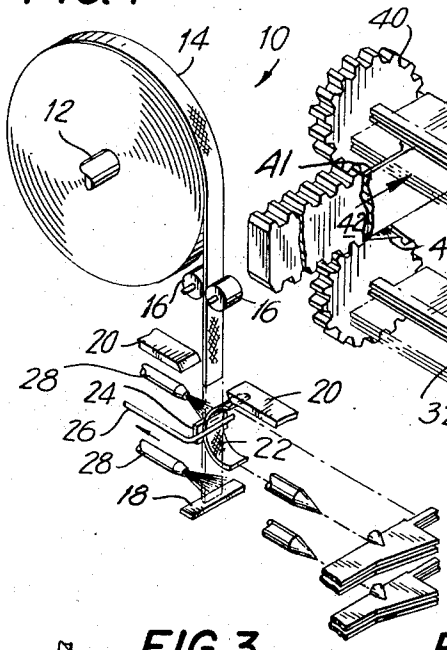


FIG. 2

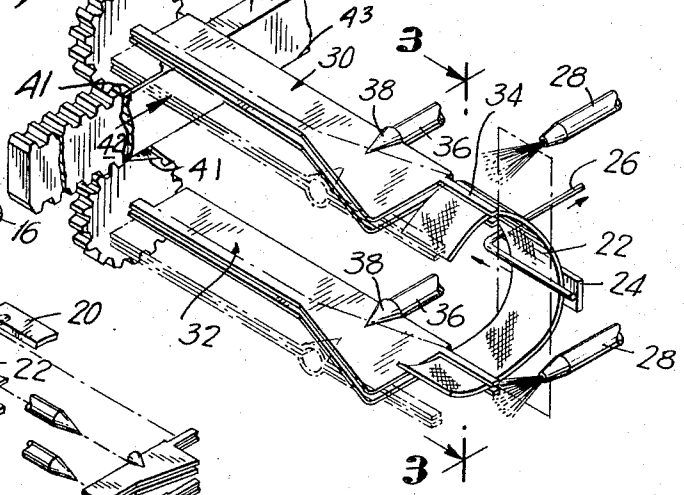


FIG. 3

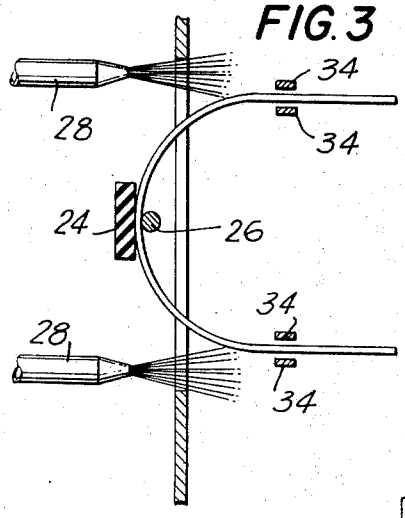


FIG. 4

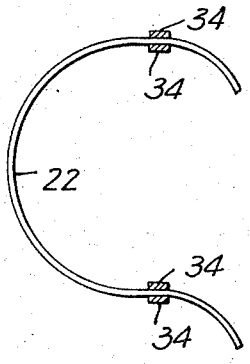


FIG. 5

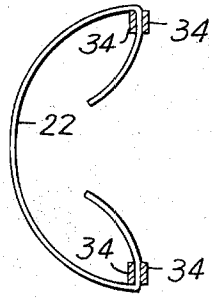


FIG. 7

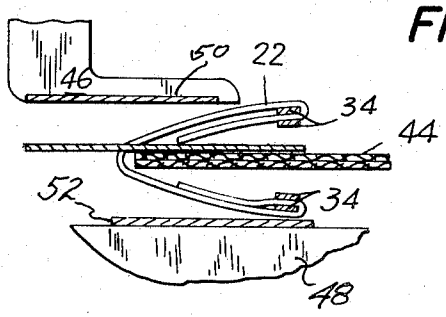


FIG. 6

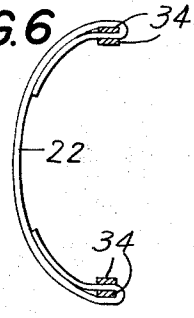
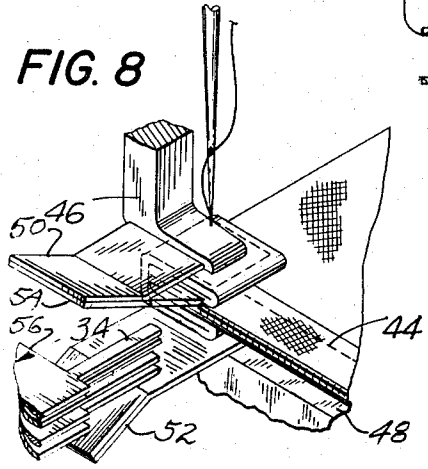


FIG. 8



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APPARATUS FOR CUTTING, FOLDING AND ATTACHING TABS OF FLEXIBLE RIBBON-LIKE MATERIAL

This invention relates to methods and apparatus for fabrication and, more particularly, methods and apparatus for fabricating folded assemblies of bodily flexible materials.

At the outset, it is to be expressly understood that, while the present invention is hereinafter described, disclosed, illustrated and shown as applied to the fabrication of seam end covers fabricated from a roll of ribbon for use in the fabrication of garments, such as women's lingerie, no intent is to be inferred thereby to limit the invention in any way to the folding of ribbon or garment fabrication but, rather, the present invention pertains to the fabrication of bodily flexible materials in general whether comprising fabric, paper, flexible metal, plastics, composites, laminates, or the like, in substantially any industry and fabrication process.

Bearing in mind the foregoing, it is generally understood that many fabrics have a tendency to unravel when cut. Hence, double folded stitched hems, overedge stitching, thread binding or binding tapes are preferably utilized on all cut edges during fabrication of many garments, such as lingerie, and the like. However, during such fabrication there often remains at the ends of seams, a raw edge which can not conveniently be hemmed or covered with an edge binding since the binding for the adjacent edges is already in place at that time during the fabrication. At times, also, no edge binding is necessary or desirable yet some means for holding the end of the seam flat is desirable. At such locations, it is conventional within the lingerie industry to stitch a small folded tab of fabric or seam end covers thereat. Since the material from which the seam end covers are fabricated may also tend to unravel at the cut ends, some treatment of these ends to prevent unravelling thereof may also be desired. For example, where the seam end covers are fabricated of thermoplastic yarns, such as nylon, it has been suggested to hot-cut the material so as to heat-seal the fibers at the cut end together to prevent unravelling. The heat-sealed portion, however, is substantially stiffer than the remainder of the cover and tends to scratch and chafe the wearer's skin. More frequently, therefore, seam end covers have been double folded, with the ends being folded or tucked inwardly to prevent unravelling of the cut ends and to present a smooth, no chafe surface to the garment and against the skin of the wearer. Prior to the present method and apparatus, however, it was not practical for a garment manufacturer to form the seam end covers in his own plant, this generally being considered to be a separate industry.

As heretofore utilized, therefore, the fabrication of such seam end covers has constituted an industry in and of itself with the garment manufacturer purchasing the seam end covers prefolded and ironed for positioning and stitching onto the garments being manufactured. The utilization of such separate, pre-fabricated and prefolded seam end covers, as have been heretofore available and conventional, while providing the answer to the problem and enabling the production of a properly finished garment has not been entirely satisfactory. Firstly, the prefolded seam end covers themselves are a relatively costly item to the garment manufacturer. Secondly, the handling, positioning and attachment of such prefolded seam end covers ordinarily requires a substantial amount of hand labor and workmanship. While attempts have been made to automatically feed such prefolded seam end covers, complete elimination of hand labor in stacking and positioning such covers and the high cost of such prefolded seam end covers has not been heretofore satisfactorily accomplished.

Bearing in mind the foregoing, it is a primary object of the present invention to provide methods and apparatus for automatically and inexpensively producing and attaching such seam end covers at the time and place of garment manufacture.

It is another primary object of the present invention, in addition to the foregoing object, to provide methods and apparatus for automatically folding, positioning and securing seam end covers from a roll of stock material.

Another primary object of the present invention, in addition to the foregoing objects, is the provision of methods and apparatus for automatically severing a length of ribbon from a roll, folding the ends of the severed length inwardly, folding the length generally medially to dispose the cut ends thereof generally within such folds, positioning the folded length of ribbon to define a seam end cover and sewing the folded seam end cover in position.

Another primary object of the present invention, in addition to the foregoing objects, is the provision of methods and apparatus for automatically severing a length of material from a roll and turning the ends thereof inwardly.

Yet still another and further primary object of the present invention, in addition to each of the foregoing objects, is the provision of novel and improved methods and apparatus for mounting seam end covers.

Another and still further primary object of the present invention, in addition to each of the foregoing objects, is the provision of novel methods and apparatus of fabrication.

The invention resides in the combination, construction, arrangement and disposition of the various component parts and elements incorporated in improved methods and apparatus for fabrication in accordance with the principles of this invention. The present invention will be better understood and objects and important features other than those specifically enumerated above will become apparent when consideration is given to the following details and description, which when taken in conjunction with the annexed drawing, describes, discloses, illustrates and shows a preferred embodiment or modification of the present invention and what is presently considered and believed to be the best mode of practicing the principles thereof. Other embodiments or modifications may be suggested to those having the benefit of the teachings herein, and such other embodiments or modifications are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

IN THE DRAWING

FIG. 1 is a schematic perspective view of a portion of an apparatus constructed in accordance with the principles of the present invention;

FIG. 2 is an enlarged perspective view of a portion of the apparatus of FIG. 1, viewed generally from the opposite side thereof;

FIG. 3 is a cross-sectional illustration taken generally along the lines 3—3 of FIG. 2;

FIG. 4 is a view similar to FIG. 3 but showing a later time in the operation of the apparatus;

FIG. 5 is a view similar to the preceding figures showing a still later time;

FIG. 6 is a view similar to the preceding figures showing a still later time;

FIG. 7 is a view similar to the preceding figures showing the seam end cover substantially fully formed; and

FIG. 8 is a perspective view of a portion of the apparatus illustrating how the seam end covers are sewn to the garment.

With reference now to the drawing, there is shown and illustrated apparatus, generally designated by the reference character **10**, constructed and arranged for advancing the free end portion of a roll of ribbon, severing a pre-determined length therefrom, grasping the severed end portion to maintain it in position, positioning the end portions of the severed length within grasping means and rotating the end portions of the severed length 180° to tuck the end portions thereof generally inside and produce a central fold therein.

More particularly, the apparatus **10** may comprise means, such as a spindle or holder **12** for supporting a roll of ribbon or ribbon-like material **14** for feeding and processing. Spaced generally beneath the supply roll **14**, there may be provided means, such as a plurality of drive rollers **16** engaging opposite sides of the roll of ribbon for feeding the ribbon downwardly to a member **18**. Spaced generally above the member **18**, there may be provided means, such as a pair of cooperating cutter blades **20** for severing the end portion of the ribbon to a desired severed length. The member **18** could preclude dropping of the severed end **22** outwardly of the apparatus. Disposed generally medially between the cutters **20** and the member **18**, there may be provided a backing plate **24** and a hook-like member **26** adapted to have the severed lengths of material **22** pass therebetween. Means, not shown, may be provided for moving the hook-like member **26** rearwardly to engage the medial portion of the severed length of material **22** against the plate **24** and thereby maintain the severed length in position. A plurality of means, such as air jets **28** may be provided disposed generally above and below the hook member **26**, as shown, and in alignment with the end portions of the severed length of material **22** which, upon actuation to provide a flow of air or other fluid outwardly therefrom bend the end portions of the severed length of material outwardly into generally U-shaped configuration with the center portion thereof being held by the hook member **26**, as shown in solid lines in FIG. **1**.

Disposed generally adjacent the portion of the mechanism heretofore described and spaced generally laterally therefrom there may be provided two sets of gripper fingers **30** and **32** fabricated, for example, of spring material, with each set comprising a pair of cooperating gripper fingers biased towards each other and having relatively narrow nose portions **34** adapted to grasp the end portions of the severed lengths of ribbon **22** therebetween. Means may be provided for opening and closing each pair of gripper fingers such as, for example, a pointed rod **36** disposed generally adjacent each pair thereof adapted to be reciprocated into engagement with and between each pair of fingers **30** and **32** to spread the pair apart. To aid in initial penetration of the pointed rods **36** between the pairs of gripper fingers, each pair may be provided with dimpled or raised portions **38** to define a generally conical space into which the conical nose of the pointed rod **36** may be readily engaged to spread the gripper fingers as shown in FIG. **2**. Means, not shown, may be also provided for advancing the finger sets laterally towards the severed length of material **22** or generally transverse the direction of advance of the ribbon past the cutters **20**. Hence, after severing of the lengths of material **22**, as in FIG. **1**, and actuation of the air jet **28** and retraction of the hook member **26**, the central portion of the severed length of material **22** may be held in position and the end portions of the severed length of material **22** extended generally outwardly in U-shaped configuration. Then, if the fingers **30** and **32** are advanced generally laterally to the position shown in FIG. **2** with the tip portions **34** thereof spaced on opposite sides of the severed length of material **22**, the end portions of the severed length of material **22** will be automatically inserted therebetween as shown in FIG. **3**. Then, upon de-activation of the air jets **28** and retraction of the pins **36**, the clamping fingers **30** and **32** will close gripping the end portions of the severed length **22** and the hook **26** may be retracted by movement thereof away from the backup plate **24** and towards the fingers **30** and **32** or towards the left as shown in FIG. **2** as indicated by the arrow, leaving the severed length of material disposed generally as shown in FIG. **4**.

Means may be provided for rotating the fingers **30** and **32** generally oppositely so as to move or fold the end portions of the severed length of material **22** generally inwardly thereof. Such means may comprise, for example, a pinion gear **40** associated with each of the finger pairs **30** and **32** spaced apart from the finger tips **34** and a double-toothed rack **42** disposed therebetween so that, upon relative movement between the rack **42** and the fingers **30** and **32**, the gear wheels **40** and associated fingers will be rotated through **180** degrees, as shown in FIGS. **5** and **6**, tucking the end portions of the severed length **22** generally inwardly.

Each of the pinion gears **40** may be provided with flattened portions **41** and the rack **42** may be provided with mating flattened portions **43** so that, when in the position shown, that is, when the flattened portions are engaged, further relative movement of the rack **42** will not result in any rotation of the pinion gears **40** but, rather, the pinion gears **40** will be aligned and positioned and restrained from any rotation. Means, not shown, may further be provided for connecting the pins **36** for movement with the rack **42** so that relative movement of the rack towards the left in FIG. **2** will, in sequence, rotate the pinion gears **40** to the position shown in FIG. **2** by engagement between the teeth of the pinion gears **40** and the teeth of the rack **42** and then engage the pins **36** between the raised portions **38** of the fingers **30** to spread them apart, while the engagement between the flattened portions **41** and **43** maintains the fingers **30** properly aligned.

Upon relative movement of the rack **42** in the opposite direction, that is, towards the right in FIG. **2**, the reverse sequence occurs. The length of the rack **42** and the number of teeth thereon may be selected so that exactly one-half a revolution of the pinion gears **40** will be produced thereby, after which the end of the rack will be reached whereupon the teeth will disengage and the pinions be free to rotate. Therefore, as will appear

in more detail hereinafter, with the rack 42 disengaged from the pinion gears 40, the fingers will be free to align with the sewing head pressure foot and base plate upon lowering of the pressure foot.

Then, with the severed length 22 foled and held by the pairs of fingers 30 and 32, the garment seam 44 may be inserted between the folds formed by the fingers, a pressure foot 46 lowered thereagainst and the fingers 30 and 32 retracted as indicated in FIG. 8. Then, by means of a cam controlled sewing machine, the seam end cover may be stitched in position.

In other words, the hook member 26 and the air jets 28 may initially form the severed length 22 into a generally U-shaped configuration while the grasping fingers 30 and 32 are retracted or positioned towards the front as shown in FIG. 1. Then, the grasping fingers 30 and 32 may be advanced or moved towards the severed length and across the end portions thereof while the end portions are being maintained extended by the air jets 28. Once the end portions of the severed length 22 are disposed between the open fingers 30 and 32, the fingers may be closed and the air jets shut off, the severed length 22 being held in a U-shaped bend by the grasping fingers 30 and 32, each pair of grasping fingers holding one leg thereof with the legs thereof extending generally parallel and in a first direction.

Upon subsequent rotation of the grasping fingers 30 and 32 in opposite directions so as to turn the end portions of the severed length inwardly, a pair of generally U-shaped outer bends are formed with the legs of the first-mentioned U-shaped bend or fold defining the outer legs of the outer U-shaped bends or folds.

If the pinion gears 40 are mounted with the fingers 30 and 32 with the rotational axis thereof offset from alignment with the finger tips 34, as shown and illustrated in FIG. 2, upon rotation thereof the finger tips 34 will, in addition to being rotated about their axis, be translated and moved outwardly to clear the severed length 22 from the feeding and cutting mechanism as shown in phantom in FIG. 2. The fingers 30 may then be moved toward the right and the tips 34 thereof positioned with the folded seam cover 22 disposed between the pressure foot 46 and the bed plate 48 of a sewing machine head so that the garment seam 44 may be readily and easily inserted therein, as shown in FIGS. 7 and 8. The fingers 30 and 32 may then be moved to the left, as seen in FIG. 8 to withdraw the tips 34 from the folded cover after the pressure foot 46 is down and before sewing so as not to interfere with the needle.

To aid in inserting the tips and folded covers 22 between the pressure foot 46 and the bed plate 48 without snagging or binding, there may be provided further a pair of oppositely flared or funnelled guide strips 50 and 52 mounted, respectively, with the pressure foot 46 and bed plate 48, as shown in FIG. 8. The guide plates 50 and 52 may be relatively rigid and, yet still further, the upper or pressure foot guide plate 50 may be provided with a flat spring wiper member 54 extending downwardly therefrom, fabricated, for example, of spring metal sheet so that as the fingers 30 move the tips 34 thereof carrying the folded tab 22 past the wiper member 54, the folds of the tab 22 will be pressed or ironed thereby and, additionally, the tab 22 will be smoothed inwardly along the tips 34 until it abuts the shoulders 56 of the fingers 30 to thereby be accurately positioned for clamping by the pressure foot 46 and subsequent sewing in place. As the pressure foot 46 is lowered against the folded tab 22, the spring wiper member 54 gives or bends upwardly.

While the invention has been described, disclosed, illustrated and shown in terms of an embodiment or modification which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodiment or modification herein described, disclosed, illustrated or shown, such other embodiments or modifications as may be suggested to those having the benefit of the teachings herein being intended to be reserved especially as they fall within the scope and breadth of the claims here appended.

What is claimed is:

1. Apparatus for forming and applying folded material, such as seam end covers to structures, such as garments comprising, in combination, means for advancing a ribbon-like material a predetermined length, means for severing such length therefrom, means for forming the severed length to a generally U-shaped configuration with the end portions thereof projecting generally equidistantly parallel from a medial portion thereof, means for grasping the end portions of said severed length subsequent to the operation of said forming means, and means for rotating said grasping means and thereby said end portions inwardly approximately 180 degrees after engaging the end portions to form such severed length into a generally centrally disposed U-shaped loop with the legs thereof extending in a first direction to define the outer legs of a pair of generally U-shaped loops having the legs thereof extending in a direction generally opposite said first direction so that upon insertion of a garment seam therebetween and application of a generally perpendicular pressure to such outer legs the U-shaped bends will be flattened into folds defining a seam end cover of conventional appearance.

2. Apparatus defined in claim 1 wherein said forming means comprises means for supporting such severed length generally medially thereof to preclude such medial portion from moving in said first direction and means for moving the end portions in said first direction prior to engagement thereof by said grasping means.

3. Apparatus defined in claim 2 wherein said moving means comprises, in turn, an air jet mounted on either side of said supporting means for blowing the end portions of such severed length outwardly therepast to initially form such severed length into a generally U-shaped configuration.

4. Apparatus defined in claim 2 wherein said supporting means comprises, in turn, a hook member extending generally transversely across such severed length movable generally laterally transversely away from such severed length so that such severed length may be freely moved in said first direction after engagement by said grasping means.

5. Apparatus defined in claim 4 further comprising backup means for cooperation with said hook member and wherein said hook member is movable toward said backup member to clamp said severed length therebetween.

6. Apparatus defined in claim 1 wherein said grasping means comprises a pair of cooperating fingers for grasping each end portion of said severed length therebetween, each of said fingers comprising an elongated portion for extending generally transversely across said severed length.

7. Apparatus defined in claim 6 wherein each of said fingers is spring biased toward the mating one of its pair and further comprising means engaging at least one of each pair of fingers to open it away from the mating one of that pair and enable substantially unhindered passage of said ribbon-like material therebetween.

8. Apparatus defined in claim 7 wherein said opening means comprises a tapered pin selectively positionable between the fingers of one of said pairs to spread that pair apart.

9. Apparatus defined in claim 1 further comprising means for swinging each of the end portions of such severed length in opposite direction approximately 90° from a substantially straight position wherein said end portions extend away from each other to a position generally parallel one another so as to form the severed length to a generally U-shaped configuration prior to engagement thereof by said grasping means.

10. Apparatus defined in claim 9 wherein said means for swinging comprises means for supporting the severed length generally medially thereof to preclude such medial portion from moving toward such parallel position and an air jet mounted on either side of said supporting means for blowing the end portions of such severed length outwardly therepast.

11. Apparatus defined in claim 10 wherein said grasping means comprises, in turn, a pair of cooperating fingers movable generally transversely between a first position out of alignment with the path of travel of the end portions of such severed length during such swinging movement to allow such end portion to swing into general alignment with said fingers and into position for engagement with the end portion of such severed length after such swinging movement thereof.

12. Apparatus defined in claim 1 wherein said means for rotating said grasping means comprises a pinion gear mounted for rotation with each of said grasping means and a rack reciprocable therebetween.

13. Apparatus for forming a longitudinally extensive bendable material to a configuration having a generally intermediate fold with the end portions of said length of material folded inwardly thereof comprising, in combination, positioning means for gripping said material generally intermediate its end portions, a pair of spaced apart means for simultaneously grasping each of said end portions and means for rotating said grasping means in opposite directions around parallel axes extending transverse said length of material so that said end portions are folded towards each other.

14. Apparatus for forming a length of bendable material to a configuration having a pair of folds generally intermediate the ends of said length with the end portions of said length of material folded inwardly comprising, in combination, means for bending said length of material to a generally U-shaped configuration and a pair of spaced apart means for simultaneously grasping each of said end portions and means for rotating said grasping means in opposite directions around parallel axes extending transverse said length of material so that said end portions are folded towards each other and toward the portion of said length of material medial said folds.

15. Apparatus defined in claim 14 wherein said rotating means rotates each of said grasping means approximately 180° to fold the end portion grasped thereby generally against the inside surface of said medial portion.

16. Apparatus defined in claim 14 wherein said bending means comprises means for supporting such length of material generally medially thereof to preclude such medial portion from moving in a first direction and means for moving the end portions in said first direction prior to engagement thereof by said grasping means.

17. Apparatus defined in claim 16 wherein said moving means comprises, in turn, an air jet positioned on either side of said supporting means for blowing the end portions of such length outwardly therepast to initially form such length into a generally U-shaped configuration.

18. Apparatus defined in claim 16 wherein said supporting means comprises, in turn, a hook member extending generally transversely across such length of material movable generally laterally transversely away from such length of material so that such length of material may be freely moved in said first direction after engagement by said grasping means.

19. Apparatus defined in claim 18 further comprising backup means for cooperation with said hook member and wherein said hook member is movable toward said backup member to clamp said length of material therebetween.

20. Apparatus defined in claim 14 wherein said grasping means comprises a pair of cooperating fingers for grasping each end portion of said length of material therebetween, each of said fingers comprising an elongated portion for extending generally transversely across said length of material.

21. Apparatus defined in claim 20 wherein each of said fingers is spring biased toward the mating one of its pair and further comprising means engaging at least one of each pair of fingers to open it away from the mating one of that pair and enable substantially unhindered passage of the end portions of said length of material therebetween.

22. Apparatus defined in claim 21 wherein said opening means comprises a tapered pin selectively positionable between the fingers of one of said pairs to spread that pair apart.

23. Apparatus defined in claim 14 further comprising means for swinging each of the end portions of said length of material in opposite directions approximately 90° from a substantially straight position wherein said end portions extend away from each other to a position generally parallel one another so as to form the severed length to a generally U-shaped configuration prior to engagement thereof by said grasping means.

24. Apparatus defined in claim 23 wherein said means for swinging comprises means for supporting the length of material generally medially thereof to preclude such medial portion from moving toward such parallel position and an air jet mounted on either side of said supporting means for blowing the end portions of said length of material outwardly therepast.

25. Apparatus defined in claim 24 wherein each of said grasping means comprises, in turn, a pair of cooperating fingers movable generally transversely between a first position out of alignment with the path of travel of the end portions of said length of material during such swinging movement to allow such end portion to swing into general alignment with said fingers and into position for engagement with the end portion of said length of material after such swinging movement thereof.

26. Apparatus defined in claim 14 wherein said means for rotating said pair of grasping means comprises a pinion gear mounted for rotation with each of said grasping means and a rack member having rack teeth on opposite side edges thereof reciprocable between said pinion gears with said rack teeth engaged therewith.

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