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Friedman et al.

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[54] **FOLDING MECHANISM**

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Related U.S. Application Data

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[52] **U.S. Cl.** **112/152**, 112/121.27

[51] **Int. Cl.** **D05b 35/10**

[58] **Field of Search** 112/152, 153, 136, 112/52, 104, 121.26, 121.27

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Primary Examiner—H. Hampton Hunter

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[57] **ABSTRACT**

Apparatus primarily powered by a single linear motor for grasping the ends of a length of ribbon or other flexible material, folding the material to a generally U-shaped configuration with the ends tucked generally inwardly to form, for example, a garment seam cover and simultaneously moving the material along a generally L-shaped path to a sewing location with the apparatus being controlled and synchronized primarily from movement of the motor and linkages driven thereby.

13 Claims, 7 Drawing Figures

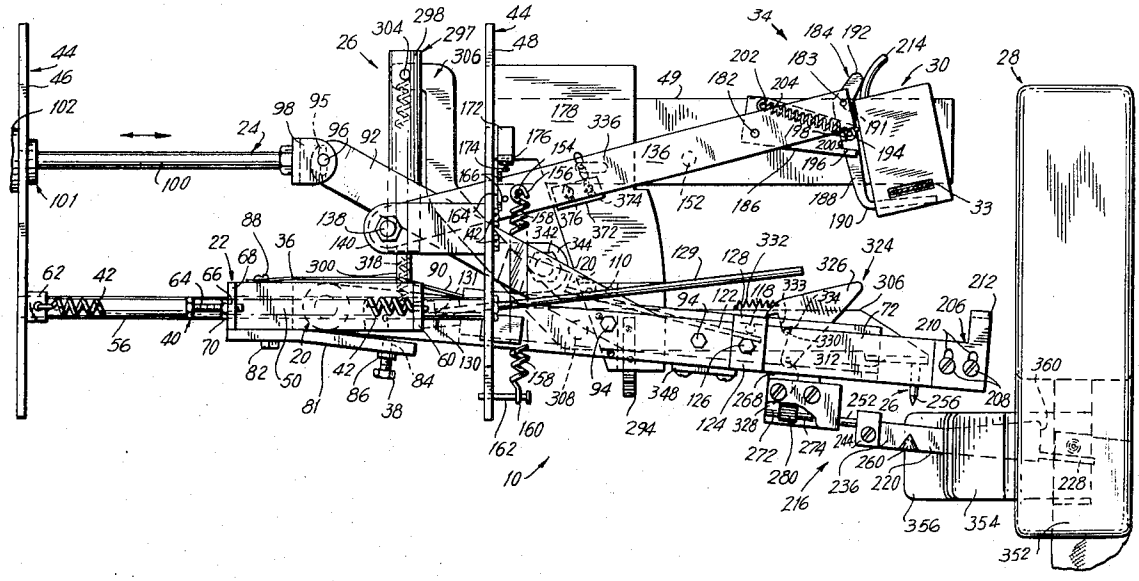


FIG. 1

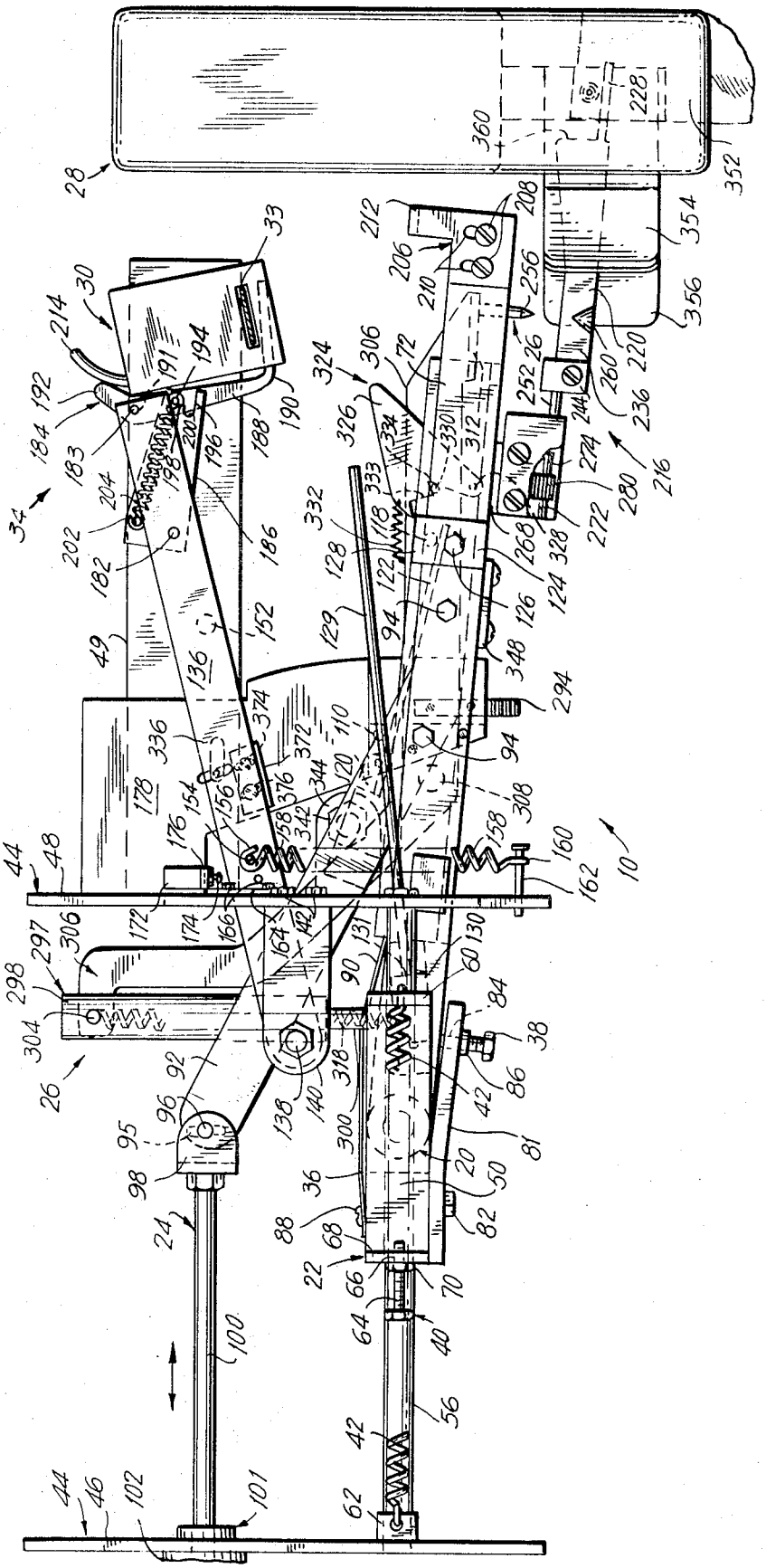


FIG. 2

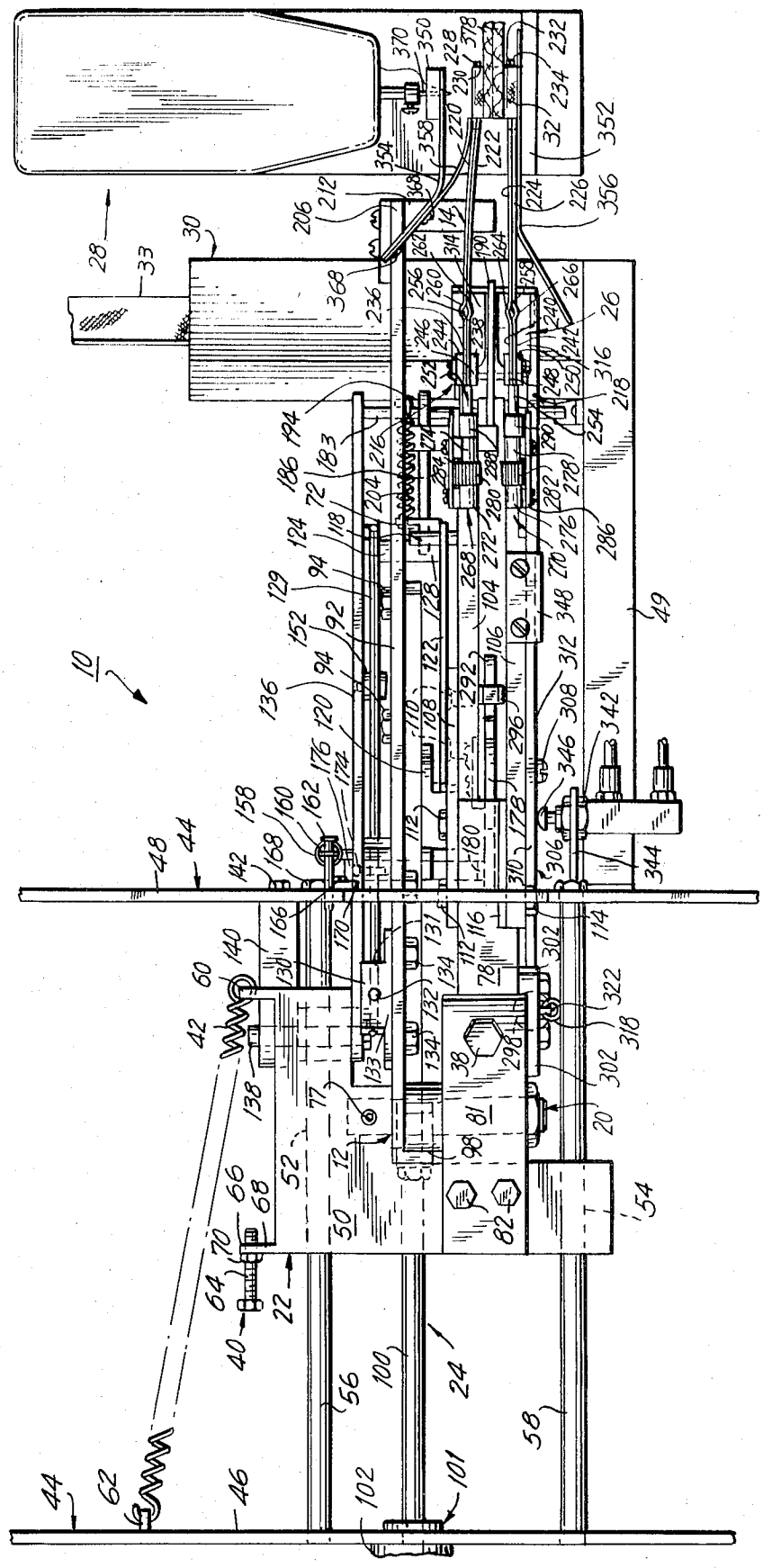


FIG. 3

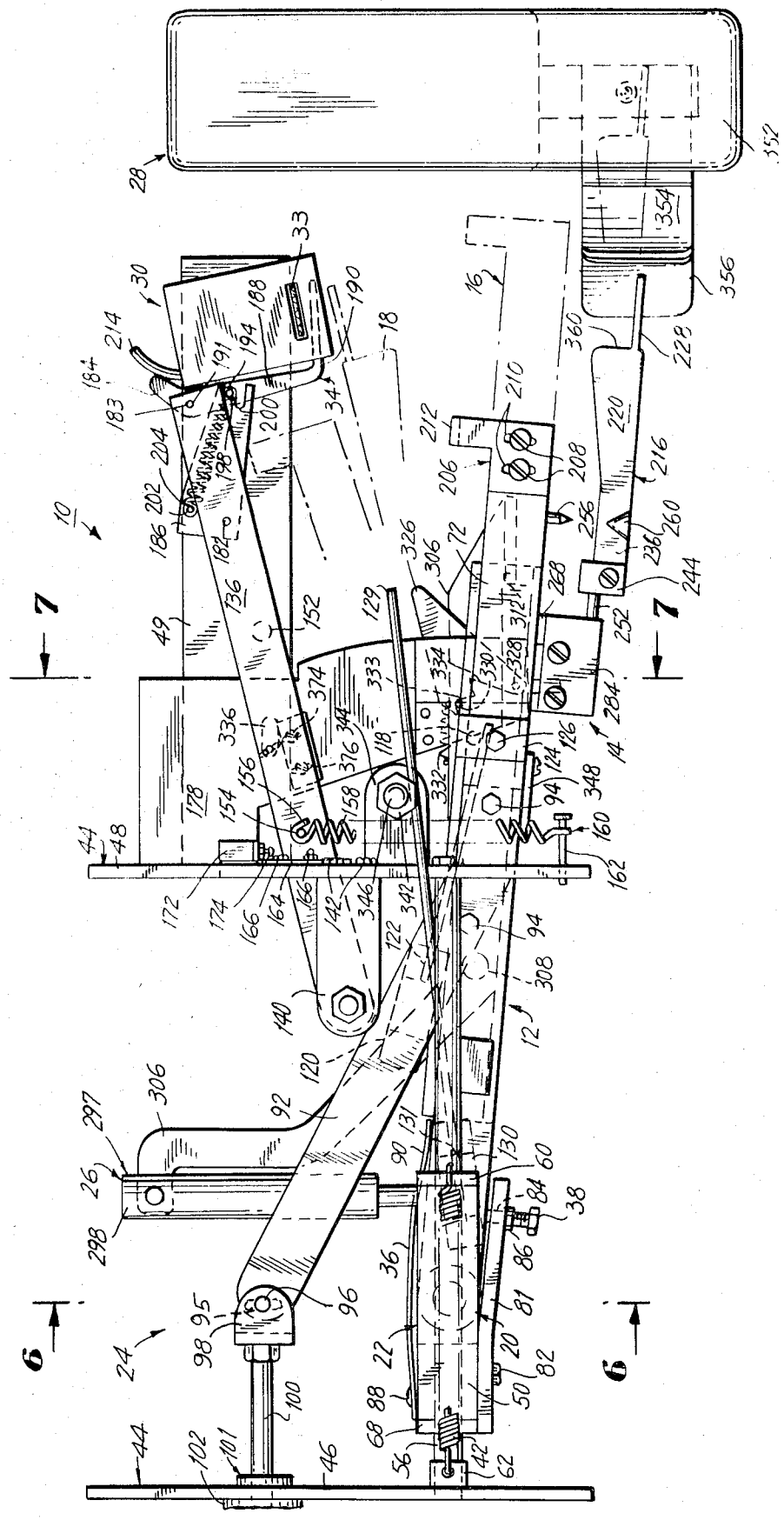
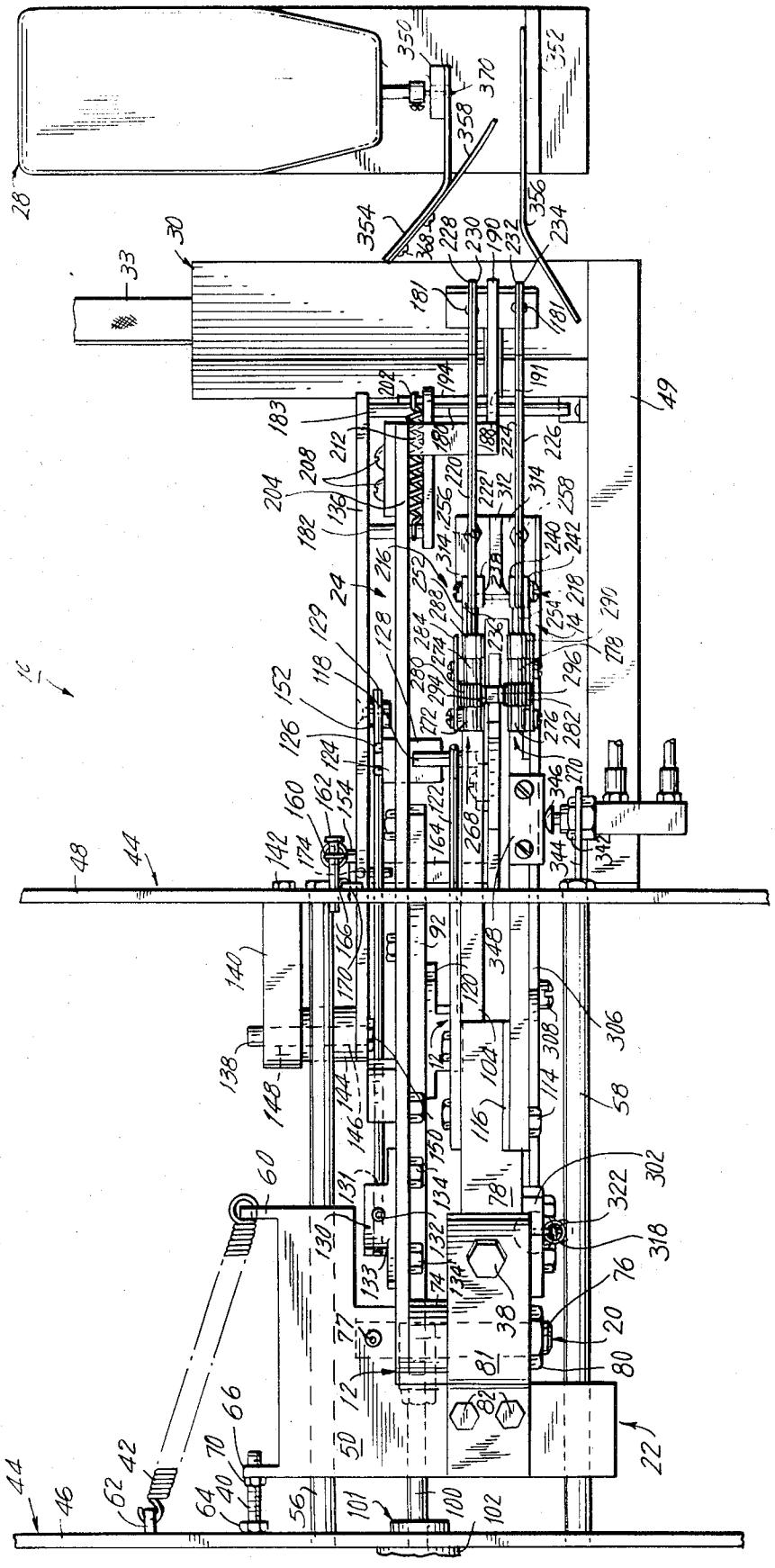

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FIG. 4



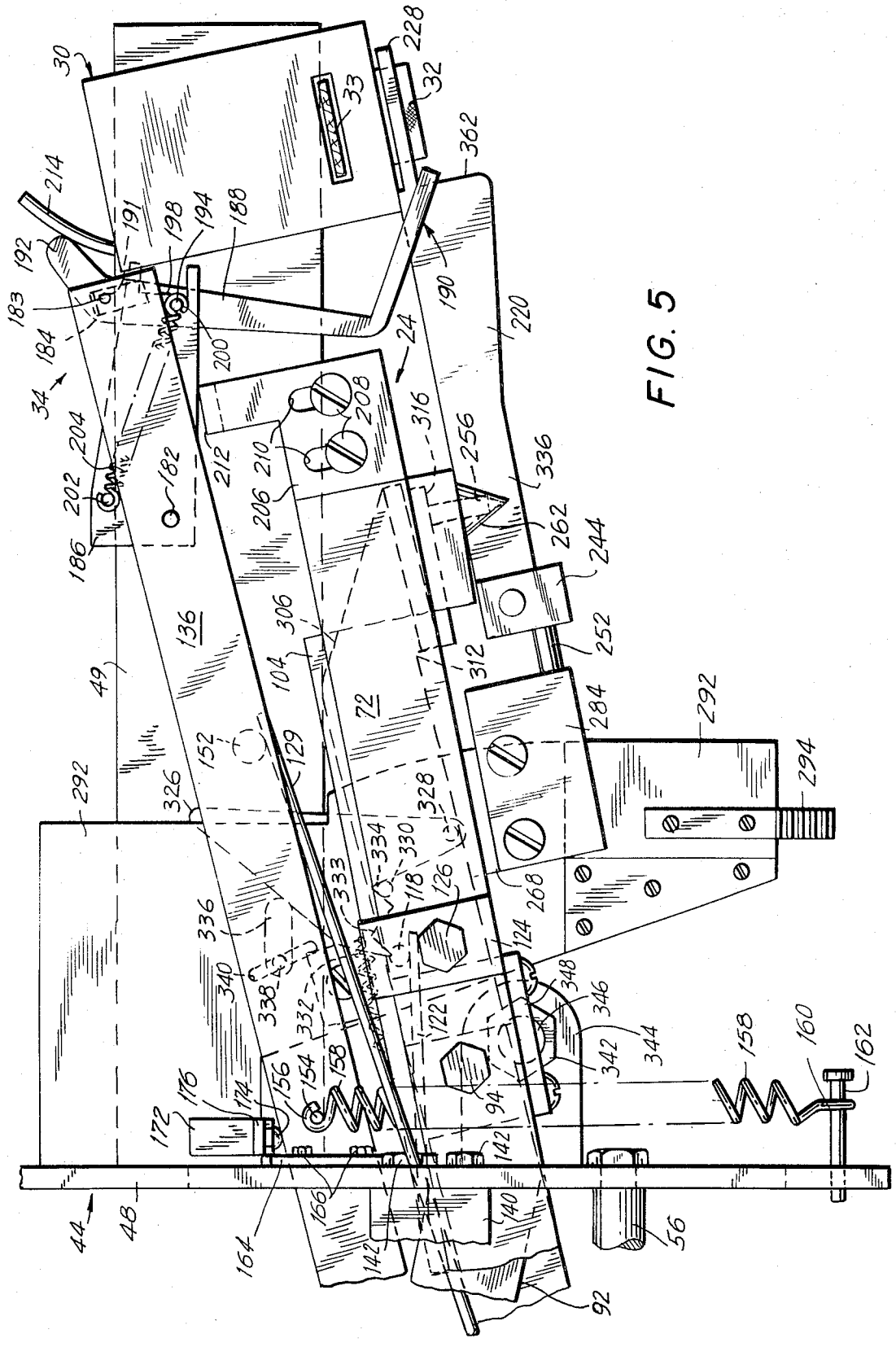


FIG. 5

FIG. 6

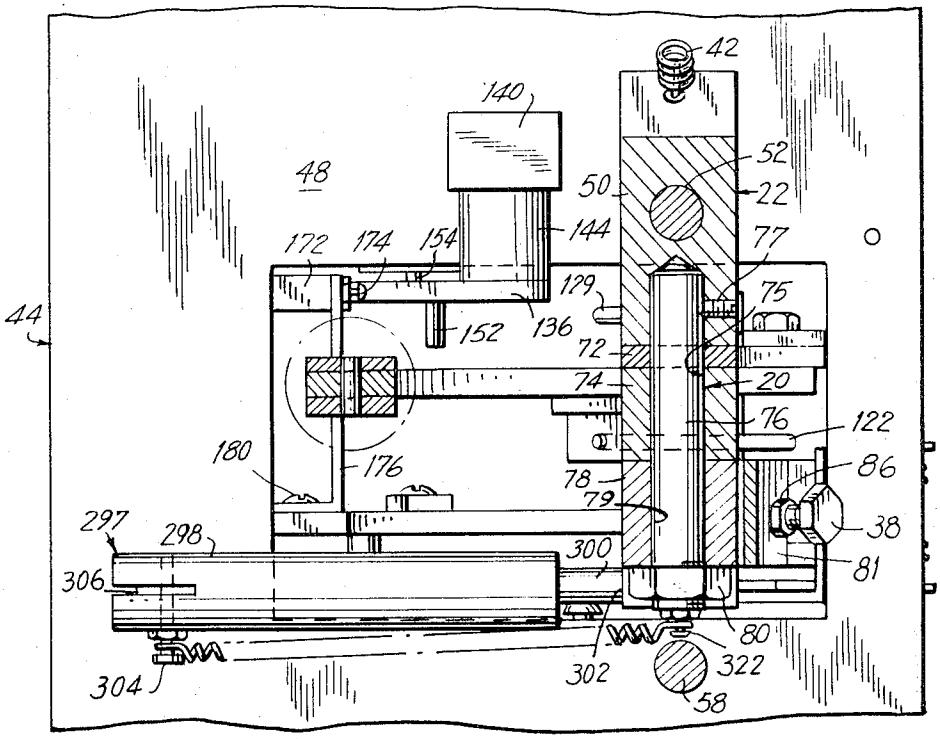
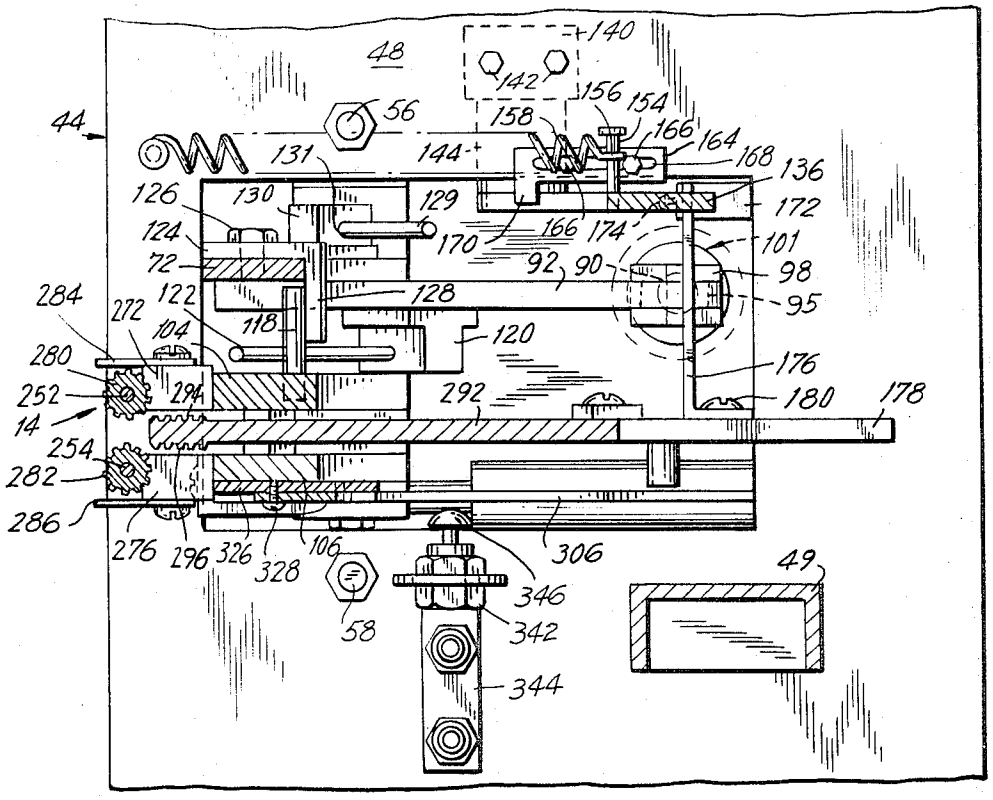

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FIG. 7


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FOLDING MECHANISM

This application is a continuation-in-part of our co-pending application Ser. No. 157,963 filed June 29, 1971, and the full and complete disclosure thereof is hereby incorporated herein, by reference, as fully and completely as if reproduced hereat.

This invention relates generally to mechanisms and, more particularly, to a mechanism for folding and moving a material and finds particular utility in a mechanism for folding a cut length of ribbon to form a garment seam cover and moving it along a generally L-shaped path to a sewing location.

In our aforesaid prior, co-pending application, methods and apparatus are disclosed for severing a length of ribbon from a roll, folding the severed length of ribbon to form a seam end cover and stitching the seam end cover so formed to a garment seam. In accordance therewith the ends of the severed length of ribbon are gripped between pairs of gripping fingers, the fingers rotated in opposite directions to 180 degrees from each other to fold the cut ends inwardly and the fingers moved to position the folded cover beneath the pressure foot of a sewing head. Thence, after lowering of the pressure foot to hold the seam end cover in position on the garment, the fingers are withdrawn to enable the cover to be stitched into place. In moving between the location whereat the grasping fingers initially grip the severed ends of the ribbon and the location whereat the folded cover is disposed beneath the sewing head pressure foot, it is preferable that the gripping fingers move along a generally L-shaped path, one leg of which withdraws the severed length of ribbon generally perpendicularly forwardly of the cutting mechanism and the second leg of which is at a general right angle thereto so that upon movement of the fingers returning along the second leg, the grasping fingers will be withdrawn from between the folds of the tab or cover.

Bearing in mind the foregoing, it is a primary object of the present invention to provide methods and apparatus for moving a device, such as a pair of seam end cover gripping fingers along a generally L-shaped path.

Another primary object of the present invention, in addition to the foregoing object, is to provide such apparatus wherein one leg of the path is generally linear so as to enable, for example, easy withdrawal of the gripping fingers from the folded seam end cover.

Yet another primary object of the present invention, in addition to each of the foregoing objects, is the provision of such apparatus utilizing a single drive means for sequentially moving the device along the legs of such path.

Still another primary object of the present invention, in addition to each of the foregoing objects, is the provision of such apparatus which is reversible so as to enable cyclic operation thereof.

Yet another and still further primary object of the present invention, in addition to each of the foregoing objects, is the provision of such apparatus for automatically forming and folding seam end covers.

Yet still another primary object of the present invention, in addition to each of the foregoing objects, is the provision of such apparatus which is essentially automatic and self-synchronizing in operation.

Another and still further primary object of the present invention, in addition to each of the foregoing objects, is the provision of such apparatus which is durable and accurate in continued repetitious use.

A yet further primary object of the present invention, in addition to each of the foregoing objects, is the provision of novel apparatus of the class described.

A still further primary object of the present invention, in addition to each of the foregoing objects, is the provision of novel apparatus and mechanism for the generation of complex motions from a linear actuator.

The invention resides in the combination, construction, arrangement and disposition of the various component parts and elements incorporated in improved apparatus and mechanism 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 top plan view of an apparatus or mechanism in accordance with the present invention in a first position thereof;

FIG. 2 is a front plan view of the mechanism as shown in FIG. 1;

FIG. 3 is a top plan view of the apparatus or mechanism in a second position thereof;

FIG. 4 is a front plan view of the apparatus or mechanism as shown in FIG. 3;

FIG. 5 is an enlarged top plan view of a portion of the apparatus or mechanism in a third position thereof;

FIG. 6 is a side elevational cross-sectional view taken along line 6—6 of FIG. 3; and

FIG. 7 is a side elevational cross-sectional view taken along line 7—7 of FIG. 3.

With reference now to the drawing, there is shown and illustrated an apparatus or mechanism constructed in accordance with the principles of the present invention and designated generally by the reference character **10**. The apparatus **10** comprises means designated generally by the reference character **12** for supporting a device designated generally by the reference character **14** for movement along a generally L-shaped path, one leg of which is generally linear corresponding to the change in position between the position illustrated in FIG. 1 and the position illustrated in FIG. 3, shown in phantom in FIG. 3 and designated generally by the reference character **16** and the other leg of which is generally arcuate and corresponds to the change in position between the position shown in FIG. 3 and the position shown in FIG. 5 and illustrated in phantom in FIG. 3 and designated generally by the reference character **18**. The means **12** is supported for generally pivotal movement by means of support means designated generally by the reference character **20** which, in turn, is supported by means for enabling reciprocation thereof designated generally by the reference character

22. Yet further, means, designated generally by the reference character 24 is provided for moving the device supporting means 12 and urging it along the L-shaped path.

Yet further, there is shown and illustrated means, generally designated by the reference character 24 for operating the device 14; a sewing head designated generally by the reference character 28 for sewing the formed seam end covers into position; feeding and severing means, designated generally by the reference character 30 for severing a length 32 of a roll of ribbon 33 or the like to be formed into seam end covers and means, generally designated by the reference character 34 for gripping the length of ribbon 32 generally centrally thereof to form a first fold therein when bent thereabout. Means is also provided connected with the device supporting means 12 for restricting movement thereof including, inter alia, spring means, such as a leaf spring 36 for urging the device supporting means 12 towards rotation in a first direction, forward stop means 38 for limiting the rotation thereof, end stop means 40 for limiting the reciprocation thereof, and return spring means 42 for urging the support means 22 in a first direction of movement toward the end stop 40. The entire mechanism may be supported on means, such as frame means 44.

The frame means 44 may comprise, for example, an end plate 46 extending generally vertically of the mechanism 10 and an intermediate plate 48 spaced apart therefrom. The means 30 may be mounted therewith by a member 49. The means 22 for supporting the pivot 20 may comprise a slide 50 provided with a pair of generally cylindrical apertures 52 and 54 through which there may be extended a pair of drive slide ways 56 and 58, respectively, fabricated, for example, of drill rod, or the like, and secured at their ends with the plates 46 and 48 so as to extend therebetween generally parallel one another enabling the slide 50 to slidably move therealong between the plates 46 and 48. The spring 42 may, as shown, be secured at one end portion with a boss or eye 60 forming a part of the slide 50 and at the other end portion thereof with a boss or eye 62 mounted on the plate 46 and may comprise an extension spring 42 extending therebetween urging the slide 50 toward the end plate 46. The stop means 40 may, for example, as shown, comprise an adjustable stop screw 64 engaged with a threaded aperture 66 provided in an extension 68 of the slide 50 so as to extend generally parallel the slide ways 56 and 58 and may be locked in adjustment position, as by means of a lock nut 70. Accordingly, the slide 50 tends to move towards the end plate 46 and the extent of movement of the slide 50 toward the end plate 46 permitted may be controlled by the adjustable stop 40.

The means 24 for moving the support 12 may comprise a generally elongated drive arm 72 having a generally cylindrical hub portion 74 with a bore 75 rotatably carried by the support means 20 comprising a generally cylindrical pivot pin 76 secured with the slide 50 by means of a set screw 77, so that the drive arm 72 is rotatable about the pivot pin 76 in a generally horizontal plane. In the space generally below the drive arm 72, and pivotably carried by the pivot pin 76, the supporting means 12 may be provided, comprising a pickup arm 78 provided with a generally vertically extending bore 79 through which the pivot pin 76 extends so that the pickup arm 78 is similarly pivotably carried by the pivot pin 76. Means, such as a nut 80 may be provided threadedly associated with the lower end portion of the pivot pin 76 for retaining the drive arm 72 and the pickup arm 78 thereon.

A generally rectangular bent plate 81 may be secured with the slide 50, as by means of machine screws 82 and provided with a threaded aperture 84 into which the threaded forward stop 38 may be threaded and held in position, as by means of a lock nut 86 to limit the pivotal movement of the pickup arm 78 in the forward direction. The leaf spring 36 may be mounted with the slide 50, as by means of a screw 88 at one end thereof, bearing at the other end 90 thereof against the rear of the pickup arm 78 for biasing the pickup arm 78 generally forwardly against the forward stop 38. Accordingly, the pickup arm 78 is rotatable relative the frame 44 on the pivot pin 76 and slidable relative thereto along the ways 56 and 58 and is biased towards a forward and leftward position (as in FIG. 3) by means of the leaf spring 36 and tension spring 42 and limited in the leftward movement by the stop 40 and limited in the forward direction by the stop 38.

Mounted with the drive arm 72 and extending generally obliquely outwardly thereof from a generally intermediate portion thereof there may be provided a drive arm extension 92 mounted with the drive arm 72 for movement therewith, as by means of cap screws 94 passing through one end portion thereof and threadedly engaged with corresponding threaded apertures provided in the drive arm 72. At the other end portion of the drive arm extension 92, there may be provided an enlogated slot 95 through which there may be positioned a generally vertically extending pivot pin 96 engaged therewith and with a bifurcated clevise 98 carried by the end portion of a piston rod 100 forming a part of a fluid motor 101 and having a piston (not shown) reciprocable within a cylinder 102 thereof to further define the moving means 24. Hence, upon the application of fluid pressure within the cylinder 102 on opposite sides of the piston thereof, the piston rod 100 may be reciprocated generally parallel the slide ways 56 and 58 to move the clevise 98, clevise pin 96 and associated end portion of the drive arm extension 92. The slot 95 of the drive arm extension 92 may be elongated, as in a Scotch yoke mechanism so as to provide clearance of the clevise pin 96 during swinging movement of the drive arm extension 92.

Accordingly, upon retraction of the piston rod 100, i.e., movement thereof towards the left from the position shown in FIG. 1, the drive arm extension 92 will be withdrawn to the left, as will the drive arm 72 and slide 50 along the slide ways 56 and 58, the spring 36 being effective, in a manner to be more fully detailed hereinafter, to prevent rotation of the drive arm 72 about the pivot pin 76 until the stop 40 engages the frame wall 46, as shown in FIG. 3. Continued retraction of the piston rod 100, i.e., movement towards the left after engagement of the stop 40 with the frame wall 46 will result in pivotal movement of the drive arm 72 about the pivot pin 76 generally counter-clockwise as viewed from above to the position shown in FIG. 5. Accordingly, the single movement of the piston rod 100 to the left or inwardly of the cylinder 102 from the position shown in FIG. 1 results in a compound movement of the drive arm 72 with the drive arm 72 first moving generally linearly to the left until the adjustable stop 40 engages the frame wall 46 followed by pivotal move-

ment of the drive arm 72 about the pivot pin 76 generally counterclockwise. Hence, any location on the drive arm 72 follows a generally L-shaped path having a linear component corresponding to the leftward movement of the slider 50 followed by arcuate movement corresponding to pivoting of the drive arm 72 about the pivot pin 76.

Upon extension of the piston rod 100, an opposite sequence of movements occurs with the drive arm 72 initially pivoting generally clockwise around the pivot pin 76 while the spring 42 maintains the slider 50 in its extreme leftward position with the stop 40 engaged against the frame wall 46 until the drive arm 72 engages the pivotal stop 38 after which the drive arm 72 and slider 50 move generally linearly to the right along the slide ways 56 and 58.

Mounted with the pickup arm 78 for movement therewith and and extending generally longitudinally forwardly thereof and in general parallel spaced apart relationship to one another there may be provided a pickup shaft upper support 104 and a pickup shaft lower support 106, the pickup shaft upper support 104 being mounted with the pickup arm 78 by means of a pickup shaft upper support bracket 108 extending therebetween and secured with the upper support 104 as by means of countersunk flathead screws 110 and with the pickup arm 78, as by means of cap screws 112 with the lower support 106 being mounted with the pickup arm 78, as by means of cap screws 114 extending through one end portion of the lower support bracket 106 and a lower support spacer 116.

Mounted with the upper support 104 for movement therewith and extending generally upwardly thereof, there may be provided a driven pin of generally cylindrical configuration 118. For driving the driven pin 118, there may be provided depending from and secured with the drive arm 72 for movement therewith a drive spring support bracket 120 carrying a cantilevered drive spring 122 secured, at one end portion thereof, with the support bracket 120 and extending generally longitudinally parallel the drive arm 72 so that the outboard end portion thereof engages the driven pin 118 generally forwardly thereof during counterclockwise rotation of the drive arm 72 so that during such counterclockwise rotation of the drive arm 72, the pickup arm 78 and supports 104 and 106 will also be driven in a generally counterclockwise direction about the pivot pin 78 while being yet resiliently mounted with the drive arm 72 through the medium of the cantilevered drive spring 122. The drive spring support bracket 120 may be mounted, as shown, with the drive arm extension 92.

Mounted with the drive arm 72, there may be provided a generally angular drive arm forward stop 124, as by means of a machine screw 126 and having a generally depending leg 128 projecting downwardly thereof for engaging the driven pin 118 on the rearward edge thereof at the forward extreme of the angular movement of the drive arm 72. Accordingly, at the forward extreme position of the drive arm 72, corresponding to maximum extension of the piston rod 100, the drive arm forward stop 124 engages the driven pin 118 while the pickup arm 78 engages the stop 38 carried by the pickup arm forward stop plate 80.

As heretofore pointed out, the present invention is particularly useful in forming garment seam end covers in accordance with the method set forth in our heretofore cited, prior, copending parent application 32 No. 157,963 and includes means, generally designated by the reference character 34 for gripping a severed length 2 of ribbon, for example, against a resilient insert in the feeding and severing means 30, generally transversely medially thereof so that the end portions thereof may be extended generally parallel one another to form the length of material 32 to a generally U-shaped configuration. The means 34 for gripping the severed length of ribbon 32 may be synchronized to the drive arm 72 by being driven or actuated thereby through the medium of a resilient drive connection which may comprise, for example, a forming finger drive spring 129. The forming finger drive spring 129 may comprise an elongated, generally circular spring wire cantilevered outwardly from the drive arm 72 for movement therewith as by having its inboard end portion extending through an aperture 131 of a support bracket 130 having a locked screw 132 intersecting the aperture 131 for securing the forming finger drive spring 129 therein. The bracket 130 may be mounted to the upper surface of the drive arm 72 in any convenient manner, as by means of a plurality of cap screws 134.

The means 34 for gripping the severed length of material 32 may comprise a forming finger arm 136 of generally elongated configuration pivotally mounted at one end portion thereof by means, for example, of a pivot pin 138 extending generally vertically therethrough and through a forming finger arm support bracket 140 mounted, for example, with the intermediate frame end plate 48, as by means of a pair of cap crews 142 so that the forming finger arm 136 may pivot about the forming finger pivot 138 in a plane generally parallel the pivotal plane of the drive arm 72. The forming finger arm 136 may be provided with a generally upstanding hub 144, at one end portion thereof, having a bore 146 through which the pivot pin 138 extends and the forming finger arm support bracket 140 may be similarly provided with an aperture 148 for a similar purpose. The pivot pin 138 may, as shown, comprise a hardened bolt and may be secured in position by means of a lock nut 150 threadedly secured with the opposite end portion thereof.

The forming finger arm 136 may be further provided with a generally cylindrical driven pin 152 depending therefrom for engagement by the forming finger arm drive spring 129 during rearward movement of the drive arm 72 to pivot the forming finger arm 136 generally counterclockwise about the pivot pin 138. Yet further, the forming finger arm 136 may be provided with a generally upstanding headed pin 154 generally intermediate the hub 144 and the driven pin 152 for engagement with one end loop 156 of a tension spring 158 extending generally horizontally forwardly of the forming finger arm 136 and having the other end loop 160 thereof passed around a generally horizontally extending headed pin 162 carried by the intermediate wall 48 of the frame 44 so as to bias the forming finger arm 136 towards generally clockwise rotation, as viewed from above, against the forming finger arm drive spring 129 when in contact with the driven pin 152. The forming finger arm spring 129 is preferably oriented as shown in the plan view drawings, and particularly FIG. 1 so as to only contact the driven pin 152 during the last portion of the counterclockwise rotation of the drive arm 72. Accordingly, the forming finger drive arm 136 is

normally held in its full clockwise rotative position by the spring **158**, against a stop member **164** connected with the intermediate wall **48** of the frame **44**, as by means of a cap screw **166** extending through an elongated adjustment enabling slot **168** in the front stop **164**. The front stop **164** may, as shown, (see FIG. 7) be of generally L-shaped configuration having a generally downwardly depending stop portion **170** adapted to engage the front edge of the forming finger arm **136** at the forward extremity of the travel thereof.

A control valve or switch **172**, of the normally closed variety and having an actuator **174** extending generally forwardly in general alignment with the rear edge of the forming finger arm **136** may be mounted, for example, on a rear mounting block **176** mounted with the intermediate wall **48** of the frame member **44**, as by being mounted on a cam plate **178** mounted with and extending generally horizontally outwardly of the intermediate wall **48**. The mounting bracket **176** may be secured with the cam plate **178**, as by means of a machine screw **180** so as to position the control valve or switch **172** in a position whereat the full rearward or counterclockwise rotation of the forming finger arm **136** triggers an airflow to a pair of jets **181** positioned in general alignment with the end portions of the severed length of ribbon **32** to project the ends thereof generally forwardly while the forming finger arm **136** is in the full rearward or counter clockwise rotated position thereof.

At the outboard end of the forming finger arm **136**, i.e., the end thereof remote from the end whereat the pivot pin **138** passes through the aperture **146** and whereat the hub **144** is located, the forming finger arm **136** may be provided with a forming finger stud **183** of generally cylindrical configuration depending downwardly therefrom. Further, in spaced apart relationship to the forming finger stud **183**, the forming finger arm **136** may be, in addition, provided with a generally cylindrical forming finger latch stud **182**, depending from the forming finger arm **136** in generally parallel, spaced apart relationship to the forming finger stud **183**. Each of the forming finger studs **183** and the forming finger latch stud **182** may comprise an enlarged diameter portion depending immediately beneath the forming finger arm **136** and a reduced diameter portion extending downwardly thereof. The enlarged diameter portion of the forming finger latch stud **182** may be somewhat longer in length than the enlarged diameter portion of the forming finger stud **183** so that, in effect, each of the forming finger stud **183** and the forming finger latch stud **182** define shoulders spaced generally beneath the forming finger arm **136** with the shoulder of the forming finger stud **183** being somewhat closer to the forming finger arm **136** than the shoulder of the forming finger latch stud **182**. Pivotally carried by each of the forming finger stud **183** and the forming finger latch stud **182**, there may be provided a forming finger **184** and a forming finger latch **186** closely adjacent the respective shoulders thereof so that the forming finger **184** is somewhat above the forming finger latch **186**. The lower end portions of the reduced diameter portions of the forming finger stud **183** and the forming finger latch stud **182** may be mushroomed or spread outwardly so as to form rivet-like connections with the forming finger **184** and forming finger latch **186**, respectively, enabling pivotal movement thereof about the respective studs.

The forming finger **184** may comprise a generally forwardly extending central portion **188**, a bent nose **190** extending from the forward end portion thereof at substantially right angle orientation to the central portion **188** and adapted to pass generally in front of the intermediate portion of the severed length of fabric **32**. At the other end portion of the central portion **188** of the forming finger **184**, the forming finger **184** may be provided with a generally angularly oriented camming portion **192**. The forming finger **184** may be further provided with an aperture **191** generally at the intersection between the intermediate portion **188** and the camming portion **192** thereof through which the reduced diameter portion of the forming finger stud **183** extends so as to pivotally mount the forming finger thereat. Upon rearward movement of the forming finger arm **136**, therefore, the forming finger **184** is moved along an arcuate path generally counterclockwise, about the pivot stud **183** and the nose portion **190** thereof will be moved towards the severed length of material **32**. Generally behind the severed length of material **32** and within the means **30**, a clamping or guide member may be provided whereat, upon rearward movement of the nose portion **190** of the forming finger **184**, the severed length of fabric material or ribbon **32** will be clamped therebetween generally intermediate thereof so with air jets **181** spaced apart on opposite sides of the intermediate portion of the severed length of material **32** on the opposite side thereof from the nose portion **190** of the forming finger **184** will be effective to bend the severed length of material **32** into a generally U-shaped configuration with the legs thereof extending generally forwardly when the forming finger **184** is in the extreme counterclockwise position thereof shown in FIG. **1**.

Structurally associated with the forming finger **184** for movement therewith and located thereon generally forwardly of the forming finger stud **183**, there may be provided a generally upstanding latch pin **194** which, upon being engaged, as hereinafter detailed, by the forming finger latch **186**, maintains the forming finger **184** in its extreme counterclockwise rotated position. Accordingly, the forming finger latch **186** may be of generally elongated configuration having one end portion thereof provided with a pivotal aperture through which the forming finger latch stud **182** extends with the reduced diameter portion thereof being mushroomed therebeneath to maintain the forming finger latch **186** positioned adjacent the shoulder thereof for pivotal movement thereabout. At the outboard end portion of the forming finger latch **186**, there may be provided a stepped notch **196** having a first step **198** and a second step **200**, with the second step **200** extending closer to the forming finger latch stud **182** than the first step **198**. Accordingly, when the pin **194** is engaged with the first step **198**, the forming finger **184** is in a first position generally counterclockwise of a second position defined when the pin **194** is engaged with the second step **200**. Additionally, the forming finger latch **186** may be provided with a spring supporting pin **202** depending therefrom in generally spaced apart relationship to the forming finger latch stud **182** and, additionally, in generally spaced apart relationship to the forming finger stud **183** together with a forming finger extension spring **204** extending between the pin **202** and the pin **194** tending to bias the forming finger **184** towards generally clockwise rotation about the forming

finger stud **183** and towards movement of the pin **194** into the second step **200** of the stepped notch **196.** Additionally, the spring **204,** due to the configuration of its attachment points, e.g., the pin **194** and the pin **202,** tends to bias the forming finger latch **186** towards clockwise rotation about the forming finger latch stud **182** and, therefore, towards movement relative to the pin **194** towards the first step **198** of the stepped notch **196.** Therefore, upon rearward movement of the forming finger arm **136,** the forming finger latch spring **204** tends to rotate the forming finger latch **186** generally clockwise so that, upon rearward movement of the forming finger latch **186,** i.e., counter-clockwise, relative the forming finger arm **136** the forming finger **184** will be released with the pin **194** moving from the first step **198** of the stepped notch **196** to the second step **200** and rotated, by means of the spring **204,** generally clockwise, so as to release the severed length of material **32** from clamping action of the nose portion **190** of the forming finger **184.**

In other words, if the forming finger **184** is latched by the forming finger latch **186,** i.e., if the pin **194** is positioned in the first notch **198,** i.e., the step farthest from the forming finger latch stud **182,** the forming finger **184** will be latched or cocked so that upon rearward movement of the forming finger arm **136** the nose portion **190** of the forming finger **184** will be generally parallel the front surface of the severed length of ribbon **32** and effective to clamp the intermediate portion of the severed length of ribbon **32** so that the air jets will be effective to blow the severed end portions thereof generally forwardly to a generally U-shaped configuration. Such rearward movement of the forming finger arm **136** is effected during counterclockwise rotation of the drive arm **72** by the forming finger drive spring **129** contacting the forming finger driven pin **152.**

The outboard end portion of the drive arm **72** may be further provided with a forming finger latch trip **206** adjustably associated therewith, as by means of a pair of screws **208** threadedly associated with the forming finger latch trip **206** and extending through the drive arm **72** through a pair of elongated slots **210** so that the exact position of the forming finger latch trip **206** may be closely adjusted relative the drive arm **72.** The forming finger latch trip **206** may comprise a generally downwardly extending nose portion **212** adapted to engage the forming finger latch **186** generally intermediate the forward edge thereof so as to move the forming finger latch **186** generally counterclockwise about the forming finger latch stud **182** at some short period of time after the forming finger drive spring **124** has engaged the forming finger arm driven pin **152** and rotated the forming finger arm **136** to its extreme counterclockwise position engaging the limit stop **164.** Accordingly, upon counterclockwise rotation of the drive arm **72,** the forming finger drive spring **129** will first engage the forming finger arm driven pin **152** to rotate the forming finger arm **136** to its extreme counterclockwise position whereat the nose portion **190** of the forming finger **184** has engaged the intermediate portion of the severed length of material **32** and, subsequently, the forming finger latch trip bent nose portion **212** of the forming finger latch trip **206** will engage the forming finger latch **186** to rotate the forming finger latch **186** generally counterclockwise relative the forming finger arm **136** about the forming finger latch stud **182** and permit the pin **194** of the forming finger **184** to enter the second step **200** of the stepped notch **196** of the forming finger latch **186** and, thereby, enable generally clockwise rotation of the forming finger **184** about the forming finger stud **183** to release the severed length of material **32** from the clamping engagement thereof.

The ribbon feeding and severing means **30** may be further provided with a forming finger cam **214** extending generally rearwardly thereof and adapted to engage the forming camming portion **192** during forward movement of the forming finger arm **136** to rotate the forming finger **184** generally counterclockwise about the forming finger stud **183** to a position whereat the pin **194** of the forming finger **184** is aligned with the first step **198** of the stepped notch **196** of the forming finger latch **186** whereat the spring **204** will rotate the forming finger latch **186** generally clockwise so as to engage the pin **194** of the forming finger **184** within the first step **198** of the stepped notch **196** to thereby re-cock or re-set the forming finger **184** to the latched position thereof.

In operating the present apparatus in accordance with the method of our aforesaid prior co-pending application Ser. No. 157,963, after the intermediate portion of the severed strip of material **32** is clamped between the forming finger nose **190** and a surface (not shown) disposed behind the intermediate portion of the severed length of material **32** the material feeding and cutting means **30,** the end portions of the severed length of material **32** are blown generally forwardly past the forming finger nose portion **190** so as to form the severed length of material **32** into a generally U-shaped configuration whereat they may be grasped and rolled inwardly to form the fold of the seam end cover.

To provide such grasping and rotating, the device **14** may constitute grasping means comprising an upper pickup assembly **216** and a lower pickup assembly **218.** The upper pickup assembly **216** may comprise an upper pickup finger **220** and a lower pickup finger **222** while the lower pickup assembly **218** may comprise an upper pickup finger **224** and a lower pickup finger **226.**

Each of the fingers **220–226,** inclusive, may consist of a reduced width nose portion **228, 230, 232** and **234,** respectively, for engaging the end portions of the severed lengths of material **32** and a base portion **236, 238, 240** and **242,** respectively, by which the fingers are supported in generally cantilevered relationship by a set of pickup finger clamps **244, 246, 248** and **250** so that the fingers **220** and **222** are clamped between an upper set of clamps comprising the clamp **244** and the clamp **246** and the lower fingers **224** and **226** form a lower set of fingers clamped between a lower set of clamps **248** and **250.** The pickup finger clamps **244–250** are each constructed and arranged to clamp the base portions **236–242** of the pickup fingers **220–226** in a generally offset configuration and, additionally, to be clamped to the forward end portion of a pair of pickup finger shafts **252** and **254** rotatably supported by means to be described hereinafter so as to be generally offset and parallel to the pickup finger fabric gripping portions **228–234** so that, upon rotation of the shafts **252** and **254,** the fabric gripping or nose portions **228–234** will be moved arcuately thereabout. Accordingly, when the end portions of the length of fabric **32** are grasped between the pairs of pickup finger nose portions **228** and **230,** grasping the upper end portion of the severed length of fabric **32** and **232** and

234 grasping the lower end portion of the length of fabric 32, the end portions thereof will be turned inwardly during rotation in the appropriate direction of the pickup fingers 220–226.

In addition to the means for rotating the shafts 252 and 254, the means for operating the device 14, which is generally designated by the reference character 26, may comprise a pair of pickup finger spreader points 256 and 258 for insertion between the pairs of fingers 220 and 222 and 224 and 226, respectively. In other words, the point 256 may be selectively inserted between the upper fingers 220 and 222 to provide spreading thereof and, accordingly, spreading of the fabric grasping end portions 228 and 230 to provide a space therebetween into which the upper end portion of the fabric length 32 may extend while the lower point 258 may be selectively inserted between the lower pair of fingers 224 and 226 to spread the fabric grasping portions 232 and 234 thereof, respectively, to provide a space into which the lower end portion of the severed length of fabric 32 may extend. Then, upon retraction of the points 256 and 258 or withdrawal thereof from between the respective pairs 216 and 218 of the pickup fingers, the pickup fingers will close to their adjacent configurations to grasp the end portions of the severed length of material 32 therebetween. In accordance therewith, the grasping fingers 220–226 are preferably fabricated of a majerial having substantial elasticity such as spring steel.

To aid in insertion of the pickup finger points 256 and 258 between the respective pairs of pickup fingers 216 and 218, each of the pairs of pickup fingers may be provided with generally opposed generally V-shaped indentations 260, 262, 264 and 266, respectively, so that, from the edge facing the points 256 and 258 at the time of insertion thereof therebetween, the edges between the recesses are separated slightly to define an access aperture therebetween.

To provide for rotation of the shafts 252 and 254, the upper pickup finger support 104 and the lower pickup finger support 106 may be provided with generally laterally extending extension portions 268 and 270, respectively, each of which comprises a pair of bifurcations, the upper bifurcations 272 and 274 forming bearing portions for the upper shaft 252, and the lower bifurcations 276 and 278 forming bearing portions for the lower shaft 254. Each of the shafts 252 and 254 may be provided with a pinion gear 280 and 282, respectively, mounted therewith for rotation therewith and positioned and maintained generally between the bifurcations 272, 274 and 276, 278, respectively. Additionally, to maintain alignment of the assemblies 217 and 218 when the pinions 280 and 282, respectively, are not engaged with any cooperating rack, there may be provided a pickup finger top stop 284 and a pickup finger bottom stop 286 mounted, respectively, with the extensions 268 and 270 of the pickup finger top support 104 and pickup finger bottom support 106, respectively, constructed and arranged to cooperate with a pair of stop blocks 288 and 290, respectively, mounted for rotation with the respective shafts 252 and 254 and having flatted portions adapted for engagement with the top and bottom stops 284 and 286, respectively, when the pairs of pickup fingers 216 and 218 are generally parallel one another and with the cam plate 178 as the fingers approach the means 30.

To provide for rotation of the pinions 280, and, accordingly, of the pickup fingers 216 and 218, the apparatus 10 may be further provided, carried by the generally horizontal cam plate 178 and extending forwardly thereof, a pair of rack portions 294 and 296 having the teeth thereof extending generally upwardly and downwardly, respectively, for engagement with the pinions 280 and 282 when the pickup arm 78 is in its extreme left retracted position and the pickup arm 78 is near its rearwardmost rotataive position whereat the grasping portions 228–234 of the pickup fingers 220–226 are, in sequence, approaching and then moving away from the fabric feeding and cutting means 30 while being yet spaced apart therefrom a distance greater than the extension of the end portions of the length of fabric 32 therefrom. Accordingly, after the drive arm 78 has moved to its full leftward position, i.e., with the stop member 64 engaging the wall 46 of the frame 44 and during counter-clockwise rotation of the pickup arm 78 so as to move the pickup fingers 220–226 towards the severed length of fabric 32, the pinions 280 and 282 will engage the rack members 294 and 296 so as to rotate the upper pickup finger assembly 216 generally clockwise as viewed from the end of the apparatus 10 facing the sewing head 28, i.e., the right side in the drawing and the lower pickup finger assembly 218 generally counterclockwise as viewed from the same point approximately 180° so that the grasping portions 228–234 of the pickup fingers 220–226 are disposed generally adjacent the material feeding and cutting means 30 and generally parallel one another as shown in FIG. 5. Thence, during clockwise rotation of the pickup arm 78 as viewed in FIGS. 1, 3 and 5 tending to move the pickup fingers 220–226 outwardly of the fabric feeding and cutting means 30 and after retraction of the points 256 and 258 so that the grasping portions 228–234 have grasped the respective severed end portions of the length of fabric 32, the rack members 294 and 296 will cause, through rotation of the pinions 282 and 284 generally counterclockwise rotation of the upper finger assembly 216 and clockwise rotation of the lower finger assembly 218, as viewed from the righthand end of the drawing so as to fold the severed end portions, respectively, of the severed length of material 32 generally inwardly as described in more detail in our hereinbefore referred to co-pending parent application.

In addition to the racks 294 and 296, pinions 280 and 282, and the like, used for providing rotation of the pickup fingers 236–242, the means for operating the device 14 further comprises the spreader points 256 and 258 and the associated mechanism utilized for providing selective advancement and retraction thereof, as well as for synchronizing such advance and retraction with the remainder of the mechanism. Such apparatus may, in accordance with the present invention, comprise a fluid operated spreader motor 297 including a cylinder 298 operated, for example, from a source of air or the like, having associated therewith a piston disposed therewithin and mounted with a piston rod 300 so that upon admittance of a fluid, such as air, or the like, under pressure to the interior therebetween the piston-cylinder 298–300 will expand in length. The piston rod 300 may, at one end portion thereof, and more particularly the end portion thereof remote from the cylinder 298, be mounted with the pickup arm 78 for rotation therewith, as by means of a pickup finger

spreader cylinder anchor **302** and the cylinder **298** may be associated, as by means of a pivot pin **304** with a pickup finger spreader arm **306** at one end portion thereof. The pickup finger spreader arm **306** may, as shown, be of generally L-shaped configuration pivotally connected, as by means of a pivot screw **308**, or the like, with the pickup finger lower support **106** so that the pickup finger spreader arm **306** defines a bell crank having one end portion **310** thereof extending between the pivot screw **308** and the pivot pin **304**. The other leg **312** of the bell crank defined by the pickup finger spreader arm **306** may have mounted thereto a pair of generally vertically spaced apart pickup finger spreader plates **314** and **316** to which the points **256** and **258**, respectively, are attached. Accordingly, upon elongation and retraction of the pickup finger spreader fluid motor **297**, the bell crank formed by the pickup finger spreader arm **306** will rotate about the screw **308** to advance and retract the points **256** and **258**.

For ease of operation, the fluid motor **297** may be of the single acting type and there may be further provided a spreader arm return spring **318** extending between pivot pin **304** depending from the cylinder **298** and a pin **322** depending from the support block **302** or anchor. Accordingly, when a pressurized fluid, such as air, is admitted to the interior of the cylinder **298**, the piston rod **300** will extend outwardly thereof, the spreader arm **306** will rotate generally clockwise as viewed from above, as in FIG. **1** and the points **256** and **258** will be advanced towards the fingers **236–242**. Conversely, when the cylinder **298** is vented to the atmosphere, the cylinder return spring **320** will cause retraction of the piston rod **300**, shortening of the fluid motor **297**, rotation of the spreader arm **306** generally counter-clockwise as viewed above, as shown in FIG. **1** and retraction of the points **256** and **258** from engagement between the pickup finger assemblies **216** and **218** at generally opposed U-shaped indentations **260, 262, 264** and **266**.

Yet further, latch means generally designed by the reference character **324** and comprising a latch member **236**, a latch pivot **328**, a latch pin **330** and a latch spring **332** may be provided for latching the pickup finger spreader arm **306** in its full clockwise rotative position after expansion of the piston-rod **298–300** so as to latch the points **256** and **258** in their fully advanced position between the finger assemblies **216** and **218**.

The latch member **326** may be of generally triangular configuration having the pivot pin **328** extending through an aperture provided generally adjacent one apex thereof, the pivot **328** comprising, for example, a screw extending upwardly through a corresponding aperture provided in the pickup finger shaft support **106** and threadedly engaged with the aperture provided in the latch member **326**. The spring **332** may be associated with an aperture provided in a second side of the latch member **326** and extending generally twoards the intermediate frame member **48** and having the outboard end portion thereof secured in a convenient manner with the pickup finger shaft lower support **106** so as to bias the latch member **326** towards counter-clockwise rotation, when viewed from above as in FIGS. **1, 3** and **5**. The side of the generally triangular latch member **326** extending between the connection of the spring **332** and the pivot **328** is provided with a pair of notches **333** and **334** which, when engaged with the latch pin **330** define unlatched and latched positions, respectively, with the pin **330** being structurally associated for movement with the spreader arm **306** generally adjacent the end thereof carrying the points **256** and **258**. The notch **334** extends substantially further towards the opposite apex than does the notch **333** so that, upon advancement of the points **256** and **258**, i.e., clockwise rotation of the spreader arm **306** as viewed from above, when the pin **330** is aligned with the deeper notch **334**, the latch **326** will rotate counter-clockwise so that the pin **330** will be disposed within the notch **334** to maintain the spreader arm **306** in the clockwise position thereof. When the spreader arm **306** is in such clockwise position, the spreader points **256** and **258** will be engaged between the respective fingers of the assemblies **216** and **218** to spread the tips **228–234** thereof apart, as shown in FIG. **5**. Thence, upon further rearward movement of the pickup finger supports **104** and **106**, the latch member **326** will be carried towards and into engagement with a latch trip **336** adjustably positioned on the plate **292**, as by means of a screw **338** engaged therewith through an elongated slot **340** to cam the latch member **326** generally clockwise until the pin **330** is aligned with the notch **333** whereat the latch member **326** may snap to the disengaged or unlatched position thereof and the points **256** and **258** are retracted from between the fingers of the assemblies **216** and **218** so that the finger assemblies close to grasp the ends of the severed length of fabric **32** therebetween.

In order to actuate the spreader fluid motor **297**, there may be provided a spreader valve **342** mounted, as by means of a spreader valve bracket **344** with the wall portion **48** of the frame **44** which is of the normally closed type having a press-to-operate valve head **346** adapted to be engaged for operation by means of a spreader valve actuator plate **348** mounted with the lower pickup shaft support **106** for movement therewith so that, upon reaching the end of the forward rotative motion, the valve actuator **348** will engage the head **346** of the valve **342** to extend the cylinder **300** of the spreader motor **297** to rotate the spreader arm **306** and re-set the latch **324**.

Associated with the sewing head **28** and, more particularly, secured with the pressure foot **350** thereof and with the needle plate **352** thereof there may be provided a pair of guide members and upper guide member **354** and a lower guide member **356**, respectively, for guiding the pairs of finger assemblies **216** and **218** therebetween during movement of the finger assemblies **216** and **218** theretowards. Accordingly, the guide plates **354** and **356** may diverge, one from the other, so as to form a generally funnel-like guide assembly. Further, in order to assure that the folded severed length of material **32** is properly positioned on the nose portions **228–234** of the fingers **222–226** and, more particularly, against the forward shoulders **360–366**, respectively, there may be provided a leaf form wiper spring **358** mounted with the bent portions of the upper guide member **354**, as by means of rivets **368** so that, as the finger assemblies **216** and **218** advance into the space between the guide members **354** and **356**, the folded length of severed ribbon **32** carried thereby will engage the wiper spring **358** and be pushed or biased towards the shoulders **360–366** of the fingers **222–226** so that the positioning of the folded garment seam end cover relative the pressure foot **350** and the sewing pattern

formed by the needle 370 of the sewing head 28 will be assured.

Bearing in mind the foregoing structural description, a full cycle of operation of the apparatus 10 will now be described.

Assuming that the apparatus 10 is initially in the position shown in FIG. 1 and air is being admitted, by means of a manual control actuated by the operator of the apparatus 10, to the fluid motor 101 so as to cause movement of the piston rod 100 generally inwardly thereof or to the left as viewed in FIG. 1, the drive arm 72, drive arm extension 92 and the various mechanisms connected for movement therewith will move to the left, generally linearly, guided by movement of the slide 50 along the slide ways 56 and 58. During this portion of the movement, the leaf spring 36 maintains the drive arm 72 in its full forward position as shown in FIG. 1 until the end stop 40 engages the frame wall 46. Once the end stop 40 has engaged the frame wall 46, further leftward movement of the slide 50 along the slide ways 56 and 58 is precluded so that further inward movement of the piston rod 100 into the cylinder 102 will provide pivotal movement of the drive arm 72 about the pivot pin 20 generally counterclockwise as seen in FIG. 1. During such arcuate movement, the pickup arm 78 will be similarly rotated with the drive arm 72 through the pickup arm drive spring 122 and the pinions 280 and 282 will be rotated, along with the pickup finger drive shafts 252 and 254 by engagement with the rack portions 294 and 296 so as to rotate the pickup finger assemblies 216 and 218 to the position shown in FIG. 5. When the pickup finger assemblies 216 and 218 are in that position and clear of the rack portions 294 and 296, the flatted surfaces of the stop blocks 288 and 290 will engage the cam plate 178 to maintain the pickup fingers generally parallel one another and in the orientation shown in FIG. 5. The rotative movement of the pickup arm 78 will continue in the counterclockwise direction until engagement thereof with the stop member 372 at which point the pickup fingers 220–226 will be positioned generally adjacent the material feeding and severing means 30, as shown in FIG. 5. As the pickup finger assemblies 216 and 218 approach the means 30, the points 256 and 258 will have been advanced therebetween due to actuation of the valve 342 during the rearward arcuate movement of the pickup arm 78 after the pinions 280 and 282 have cleared the rack portions 294 and 296. Accordingly, as the pickup finger assemblies 216 and 218 approach the severed length of material 32, the assemblies will have been spread apart to define a space between the respective pairs of pickup fingers. During the final segment of travel of the pickup arm 78 generally rearwardly, the forming finger drive spring 129 will move the forming finger arm 136 generally to the rear so that the nose portion 190 of the forming finger 188 will clamp the severed length of material 32 generally intermediate thereof and the air jet control valve 172 will be operated by the rearward movement of the forming finger arm 136 to provide a flow of air outwardly through the air jets 181 to project the ends of the severed length of material 32 between the pairs of pickup fingers. During the final rearward movement of the pickup arm 78, as shown in FIG. 5, the spreader latch means 324 will be actuated or cammed generally clockwise by engagement with the latch trip 336 so as to withdraw the spreader points 256 and 258 from the pickup finger assemblies 216 and 218 and enable the fingers 220 and 222 to grasp the upper end portion of the severed length of material 32 and the pickup fingers 224 and 226 to grasp the lower end portion of the severed length of material 32 therebetween. Additionally, during the final rearward movement of the drive arm 72, the downwardly extending nose portion 212 of the forming finger latch trip 206 will engage the forming finger latch 186 to rotate the forming finger latch 186 generally counterclockwise enabling the pin 194 to become aligned with the deeper step 200 of the step notch 196 so as to release the nose portion 190 of the forming finger from in front of the severed length of ribbon 32, as shown in FIG. 5.

Then, upon operation of the control valve for the fluid motor 101 in the opposite direction by the operator of the apparatus 10, the piston rod 100 will commence extension outwardly of the cylinder 102 and thereby cause rotation of the drive arm 72 generally clockwise around the pivot pin 76, forward movement of the slide 50 towards the right being restrained by the tension spring 42. Accordingly, the drive arm 72 will rotate fully clockwise until the pickup arm 78 engages the front stop 38. During the forward rotation of the drive arm 72 and pickup arm 78 with the pickup arm 78 being driven by the leaf spring 36 as permitted by the rotation of the drive arm 72, the forming finger arm 136 will rotate generally clockwise during the initial rotation of the drive arm 72 and pickup arm 78 until the forming finger arm 136 engages the stop member 164 mounted on the intermediate plate 48. The pickup arm forward stop 372 may be adjustably mounted with the cam plate 178, as by means of a pair of screws 374 extending through elongated adjustment slot 376. As the forming finger arm 136 rotates generally clockwise so that the forming finger 184 is being moved generally arcuately forwardly, the camming portion 192 thereof engages the forming finger arm cam 214 so as to rotate the forming finger 184 generally counterclockwise relative the forming finger arm 136 about the forming finger stud 183 until the pin 194 is aligned with the shallower or first step 198 of the stepped notch 196 whereat the spring 204 will re-set the forming finger latch 186 so as to be ready for the next cycle.

As the pickup arm 78 rotates generally arcuately clockwise, i.e., generally forwardly, as the forward extremity of its travel is reached, the pinions 280 and 282 again engage the rack portions 294 and 296 to rotate the pickup finger assemblies 216 and 218 counterclockwise and clockwise, respectively, to the position shown in FIGS. 1 and 3 so as to fold the end portions of the severed length of ribbon 32 generally inwardly so as to form the seam end cover. Then, upon continued outward movement of the piston rod 100 outwardly of the cylinder 102 after the pickup arm 178 has engaged the forward stop 38 at which position the pinions 280 and 282 have cleared the rack portions 294 and 296, the slide 50, drive arm 72 and pickup arm 78 will commence to move towards the right with the slide 50 moving along the slide ways 56 and 58 so that the pickup finger assemblies 216 and 218 are advanced between the guide members 354 and 356 of the sewing head 28 until, at the full extreme righthand position thereof the folded seam end cover is positioned beneath the pressure foot 350 of the sewing head 28. Then, the edge of a garment 378 may be inserted by the operator between the folded ends of the seam end

cover **32**, as shown in FIG. **2** and the pressure foot **350** lowered so as to clamp the assembly in position on the sewing head **28**. As the operator then again reverses the air flow to the drive motor **101** so as to initiate inward movement of the piston rod **100**, the seam end cover is left beneath the pressure foot **350** of the sewing machine for stitching onto the garment **378** while the mechanism re-cycles to form and position a new seam end cover.

Accordingly, the entire mechanism **10** is controlled, sequenced and timed from movement of the piston rod **24** and, accordingly, from movement of the drive arm **72**. Additionally, means are provided for appropriate adjustment of each element of the mechanism **10** to provide for such timing and control.

For convenience in description, the terms "upper," "lower," "forward," "rearward," "upward," "downward," "leftward," "rightward," "clockwise," and "counterclockwise," as used in the preceding description and subjoined claims, along with other similar directional terminology, is to be construed and interpreted with reference to the apparatus as it is shown and illustrated in the drawing. However, such terminology is not to be construed or interpreted in a limiting sense either in the preceding description or the subjoined claims, since the same is used merely to facilitate an understanding of, and to clearly set forth and distinctly define the present invention.

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 embodiments or modifications 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 cope and breadth of the claims here appended.

What is claimed is:

1. Apparatus for automatically gripping the end portion of a severed length of ribbon-like material from supply means therefor, and folding the severed length of ribbon-like material into a generally U-shaped configuration with the end portions thereof tucked inwardly thereof while moving the severed length of material to a position between the pressure foot and the bed of a sewing head for sewing, for example, to form a garment seam end cover comprising, in combination, means for holding the central portion of severed lengths of ribbon-like material and extending the end portions thereof generally forwardly of said central portion to form said material to a generally U-shaped configuration; a pair of pickup fingers for gripping each end portion of the severed length of ribbon-like material from said means; means for rotating said pairs of fingers generally oppositely about 180° to tuck said end portions generally inwardly toward said central portion; a pickup arm for supporting said pairs of pickup fingers and means for moving said pickup arm sequentially in rotation about a point spaced apart from said pickup fingers and generally longitudinally in a plane generally perpendicular said central portion so that said pickup fingers move generally arcuately and linearly along a generally L-shaped path having the legs thereof generally perpendicular each other, the opposite end portions of said legs corresponding to a pick-up position at said supply means and a release position at said sewing head, respectively.

2. Apparatus defined in claim **1** wherein said holding means comprises a forming finger movable generally within the plane of movement of said pickup arm and actuated thereby for clamping the central portion of said severed length against a fixed backup member.

3. Apparatus defined in claim **2** further comprising a forming finger arm pivotally mounted for movement generally parallel the plane of movement of said pickup arm, said forming finger being mounted for movement with said forming finger arm, a drive spring mounted for movement with said pickup arm and adapted to pivot said forming finger arm to move said forming finger arm to move said forming finger into engagement with said center portion of said severed length of material when said pickup fingers are positioned for gripping the ends thereof, and means for releasing said forming finger from such engagement upon gripping of the end portion of said severed length of material between said gripping fingers.

4. Apparatus defined in claim **2** wherein said forming finger is pivotally carried by said forming finger arm adjacent the outboard end portion thereof movable between an operative position relative said forming finger arm whereat said forming finger will engage said central portion of said severed length of material upon movement of said forming finger arm by said drive spring and a released position whereat said forming finger is released from such engagement together with spring means for biasing said forming fnger towards said released position thereof and wherein said means for releasing comprises a latch member pivotally mounted with said forming finger arm generally inboard said forming finger to selectively latch said forming finger in said operative position thereof, said latch member being constructed and arranged to be cammed and operated by said pickup arm when the end portions of said severed length of material are gripped by said gripping fingers to release said spring finger and enable automatic movement thereof to the released position thereof.

5. Apparatus defined in claim **4** further comprising spring means for said forming finger arm urging said forming finger arm against movement by said drive spring so that said forming finger arm rotates generally forwardly upon release from said drive spring together with cooperating camming means associated with said forming finger and the supply means for automatically re-setting said forming finger for automatic latching in the operative position thereof during such forward movement of said forming finger arm.

6. Apparatus defined in claim **1** wherein each pair of pickup fingers is connectd with a pinion gear generally offset from the axis of the fingers so that rotation of said pinion gears produces both rotation of said fingers about their axes and planetary movement of said fingers about the pinion gear axes to enable 180° rotation of said pinion gears to provide 180° rotation of said fingers together with a maximum translation thereof.

7. Apparatus defined in claim **1** wherein each pair of pickup fingers is provided with a pinion gear connected with a longitudinal shaft portion thereof for movement therewith and further comprising a pair of rack portions fixedly mounted for engagement by said pinion gears during said arcuate movement of said pickup arm

so that said pickup fingers will be automatically rotated thereby 180° in opposite directions.

8. Apparatus defined in claim **7** wherein said rack portions are positioned to engage said pinion gears only during that portion of the arcuate travel of said pickup arm adjacent the position of linear movement.

9. Apparatus defined in claim **8** wherein said pickup fingers are further provided with flatted portions engaging fixed flat cam portions during a portion of the arcuate travel of said pickup arm to retain said pickup finger against rotation.

10. Apparatus defined in claim **1** wherein said pairs of pickup fingers are each provided with generally U-shaped opposing indentations and further comprising a spreader arm pivotally carried by said pickup arm adjacent said pickup fingers, a pair of pickup finger spreader points carried by said spreader arm for insertion into said U-shaped indentations for spreading said pairs of fingers apart upon rotation of said spreader arm in a first direction, means for rotating said spreader arm in said first direction, latch means for selectively retaining said spreader arm rotated in said first direction, spring means for biasing said spreader arm in an opposite direction, and means for camming said latch means to release said spreader arm when said fingers are in position to grip the end portions of said severed length of material so that said spreader arm rotates in said opposite direction to withdraw said spreader points and enable said fingers to grasp said end portions.

11. Apparatus defined in claim **1** further comprising, a pivot pin carrying said pickup arm for rotation thereabout for enabling such rotation thereof and a slider carrying said pivot pin or reciprocation thereof for enabling such longitudinal component of movement of said pickup arm.

12. Apparatus defined in claim **11** further comprising a drive arm carried by said pivot pin generally parallel said pickup arm, a drive spring carried by said drive arm for resiliently driving said pickup arm in rotation about said pivot pin, a drive arm extension extending obliquely outwardly of said drive arm, and a linear motor acting on said drive arm extension generally spread apart from said drive arm and generally parallel the axis of reciprocation of said slider.

13. Apparatus defined in claim **12** further comprising a forward stop carried by said slider limiting rotation of said pickup arm away from said supply means, an end stop cooperating with said slider limiting reciprocation of said pickup arm away from said sewing head to alignment of said fingers with said supply means, spring means biasing said slider toward said end stop and spring means biasing said pickup arm pivotally toward said forward stop so that actuation of said linear motor will sequentially provide the required arcuate and reciprocating movement of said pickup arm.

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