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Bryan et al.

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[54] **WORK PIECE GUIDE SYSTEM**

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[22] Filed: **Dec. 26, 1972**

[21] Appl. No.: **318,623**

Related U.S. Application Data

[63] Continuation of Ser. No. 221,109, Jan. 26, 1972, abandoned, which is a continuation of Ser. No. 877,364, Nov. 17, 1969, abandoned.

[52] **U.S. Cl.** **226/3**, 226/15, 226/196, 112/153

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

[58] **Field of Search** ... 226/15, 17, 3, 196, 198, 197, 226/195; 112/153

[56] **References Cited**

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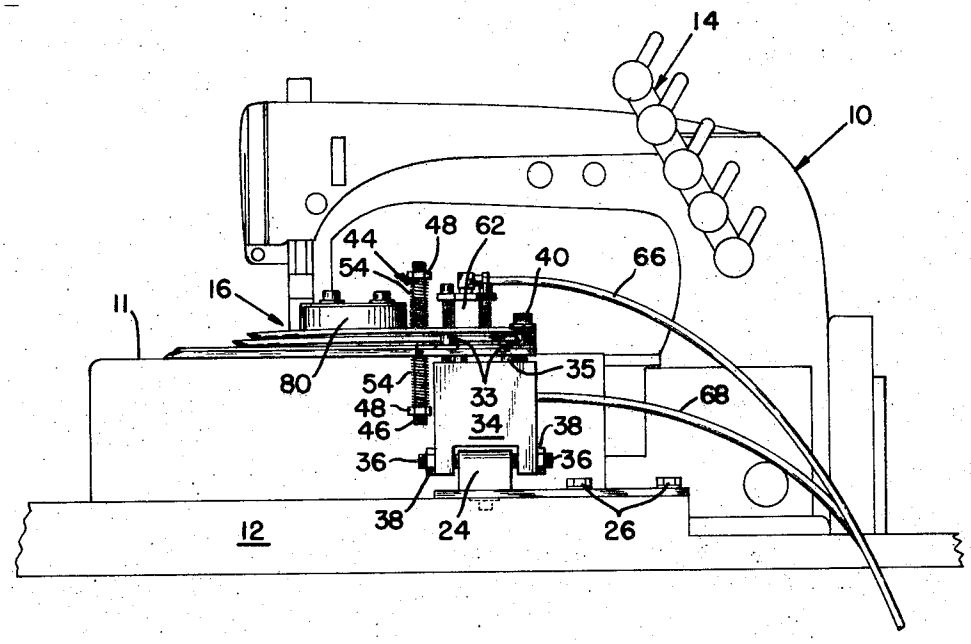
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[57] **ABSTRACT**

A system for accurately controlling and guiding the edge portions of one or more flexible fabric work pieces as they are being fed to a sewing machine stitching zone by applying a biasing or torque force to the work pieces. The torque is responsive to a linear force applied by the feed dogs and to frictional forces applied at pinch points spaced upstream and laterally of the feed dogs which linear force urges the edges of the work pieces into engagement with a guide member for maintaining a line of stitching a predetermined distance away from the edge of each work piece.

10 Claims, 7 Drawing Figures



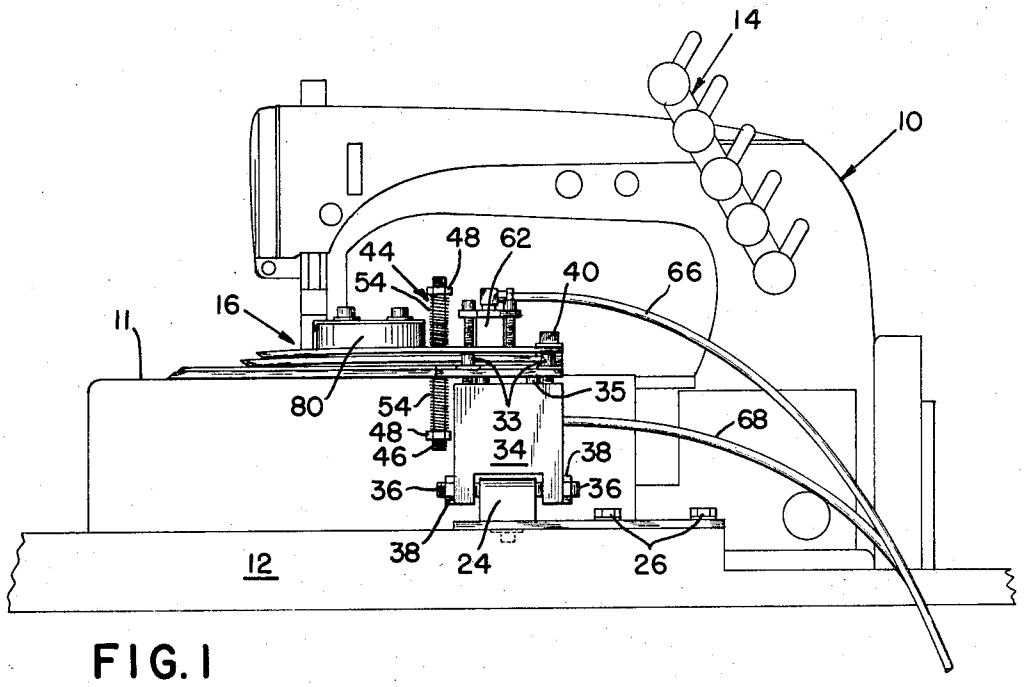


FIG. 1

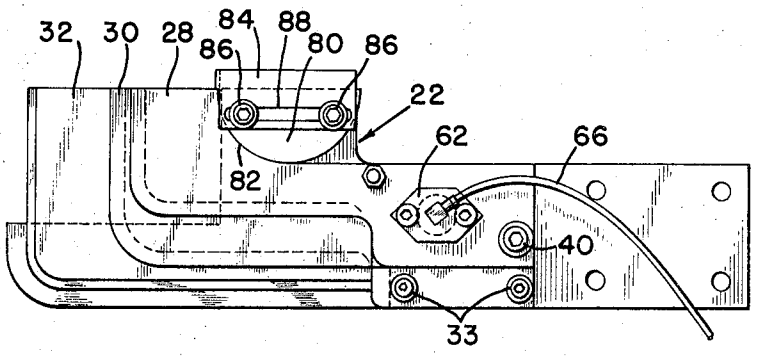


FIG. 3

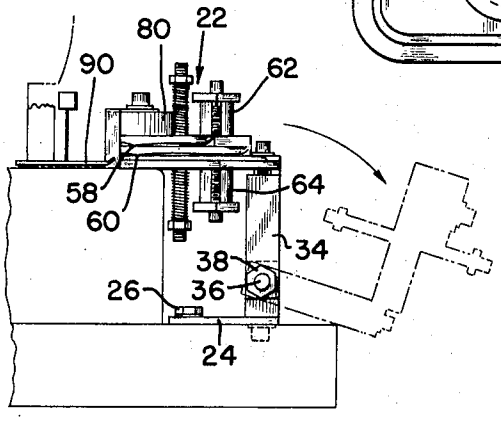


FIG. 2

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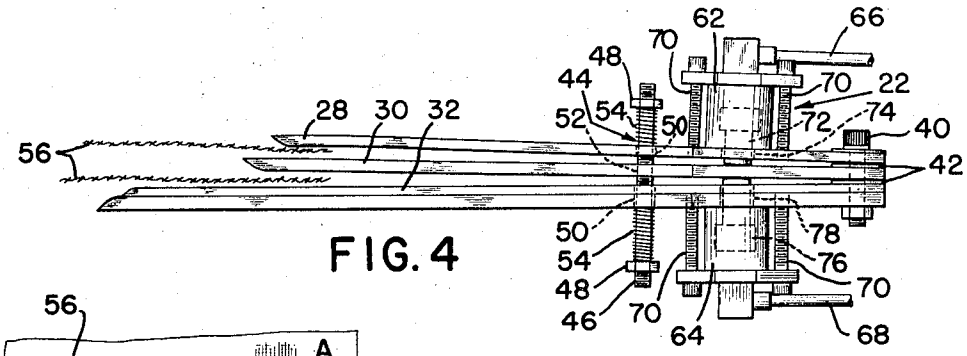


FIG. 4

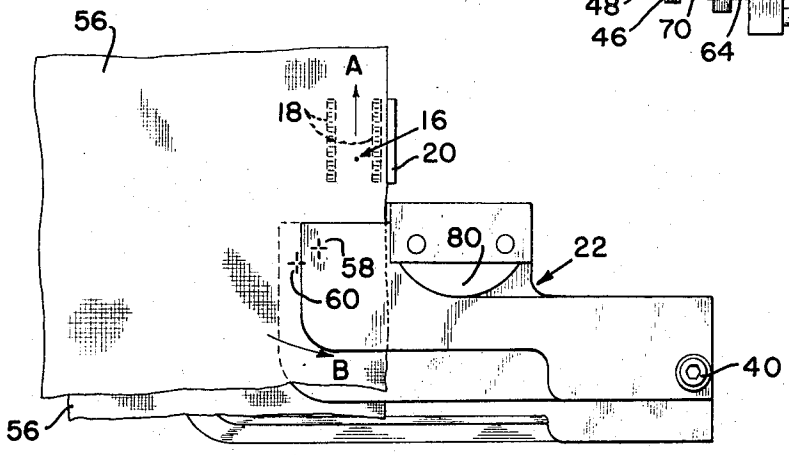


FIG. 5

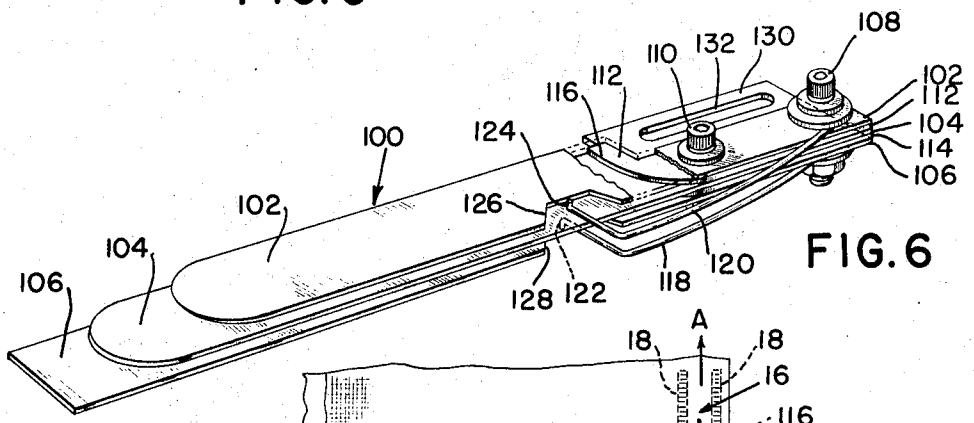


FIG. 6

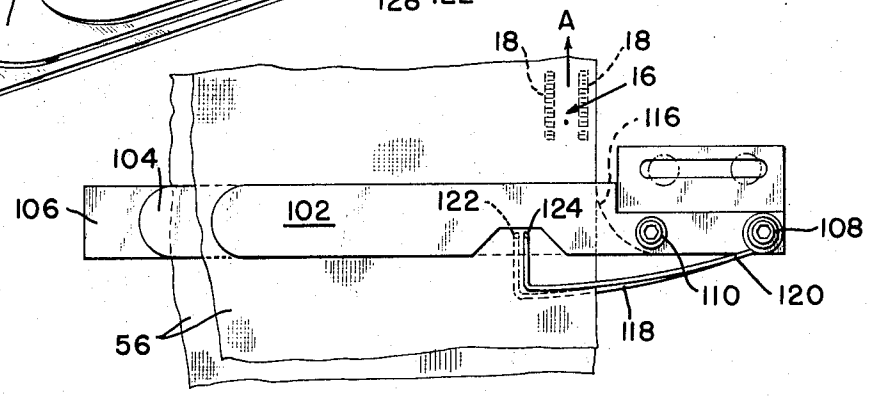


FIG. 7

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WORK PIECE GUIDE SYSTEM

This is a continuation of application Ser. No. 221,109, now abandoned filed Jan. 26, 1972, which was a continuation application of Ser. No. 877,364, now abandoned filed Nov. 17, 1969.

BACKGROUND, BRIEF SUMMARY AND OBJECTS OF THE INVENTION

This invention relates to a system for automatically guiding and controlling the movement of one or more work pieces to be operated upon through an operating zone.

More particularly, the invention relates to an automatic feed control system for fabrics or similar materials for maintaining one or more work pieces to be fed upon a linear feeding line or path conforming to the edge or contour of the work piece to place a line of stitches at a predetermined distance from the edge of the fabric.

Although the invention is of special use in conjunction with sewing machines, the basic concepts of the invention are susceptible to other uses wherein fabric-like material is fed past an operating point or tool to guide the fabric along a predetermined path of travel.

The conventional manner of feeding material to a sewing machine is manually to align one or more plies of material with the feed dogs of the machine. The machine operator must then manually align and guide the material being advanced to produce a straight line of stitches. If a curved line of stitches is desired, the material must be manually guided with sewing and orientation of the material.

The guiding assembly of the present invention for automatically controlling movement of the material includes a plurality of superposed plates adapted to receive a single ply of fabric between adjacent plates. Each ply of material is clamped between or pinched against one or more plates at points located upstream and to one side of the flow of material to the machine stitching zone. As linear motion is imparted to the material by the sewing machine feed dogs, the clamping or pinching effect applied to each layer of material within the guide assembly tends to hold the material, thus resulting in a sliding movement of the material located upstream of the stitching zone to a location with the edges thereof abutting the stop or limiting surface. The edges of the material are maintained in engagement with the abutting or stop surface for aligning the edges of two or more plies of material, even when the material is curved or contoured, such that a line of uniform stitches are maintained a predetermined distance from the edges of the fabric or material.

One of the primary objects of the invention is the provision of a guiding assembly for accurately aligning and controlling the edge portions of one or more plies of fabric as they are being fed to the stitching zone of a sewing machine.

An important feature of the invention is the provision of a guide assembly for directing superposed plies of fabric to a stitching zone and insuring the desired stitching performance without significant control by an operator.

Another feature of the invention is the provision of apparatus for guiding aligned plies of flexible material simultaneously to a sewing machine which saves material and results in an improved finished product by accurately positioning and aligning the edges of the material.

Still another feature of the invention is a fabric guide system for increasing production, and for reducing expense since less skill is required to operate the sewing machines.

Other features and advantages will be readily apparent to those skilled in the art during the course of the following description of the invention which sets forth preferred embodiments only without limiation.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a front elevational view of a sewing machine and support structure therefor, with the fabric guiding apparatus of the present invention positioned thereon.

FIG. 2 is a fragmentary side elevational view illustrating the relationship of the guiding apparatus with respect to the sewing machine;

FIG. 3 is an enlarged top plan view of the guiding apparatus of FIGS. 1 and 2;

FIG. 4 is an enlarged, fragmentary, front elevational view of the guiding apparatus of FIG. 1 illustrating the relationship of the fabric being guided thereby, with respect to the separator plates;

FIG. 5 is a top plan view of the separator plates and fabric edge stop member, having fabric guided thereby, positioned with respect to the sewing machine fabric advancing and stitching zone;

FIG. 6 is an isometric view of a modified fabric guiding apparatus adapted to be positioned upon a machine support structure; and

FIG. 7 is a top plan view of the modified fabric guiding apparatus of FIG. 6.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawing, FIG. 1 illustrates a sewing machine **10**, having a fabric support surface **11**, which is mounted on a table top or other support structure **12** of conventional form. Thread is directed from suitable thread supply sources over a conventional tension mechanism **14** into one or more needles, not shown, provided at the stitching zone **16**. Fabric feed dogs **18** are located in the stitching zone **16** for feeding the work at a predetermined rate in the direction of the arrow A in FIG. **5**. The sewing machine **10** may be provided with a conventional trimmer or cutter **20**, shown diagrammatically in FIG. **5**, for trimming off the rough edges of the fabric during and slightly in advance of the sewing operation. The cutter may be adjusted to trim the fabric at various distances from the line of sewing.

A guide assembly **22** for controlling the alignment and proper advancing movement of one or more material work pieces is adjustably mounted upon the machine support structure. The guide assembly **22** is mounted upon a bracket **24** secured to support **12** by fasteners **26**, and may be pivoted to an inoperative position shown in dotted outline form in FIG. **2**.

Guide assembly **22** includes a series of plates **28, 30, 32** which are secured to a normally vertically oriented support plate **34** which is mounted upon bracket **24**. Each of plates **28, 30, 32** has openings provided therein which are aligned to receive a fastener means **40** for maintaining the plates in assembled relation. Spacers **42** may be provided between the plates **28, 30, 32** for

adjustment purposes. The lowermost plate **32** of the guide assembly is secured to the pivoted plate **34** by fasteners **33** threadably received within the plate **34**. Spacers **35** may be positioned between plates **32** and **34** to vary the height of the guide assembly **22** with respect to the support surface **11**. The plate **34** is adapted to be adjustably positioned longitudinally of bracket **24** by means of studs **36, 36** which are threadably received within plate **34**, and maintained in position by nuts **38, 38** mounted thereon.

A tensioning mechanism **44** is provided intermediate the length of plates **28, 32** for normally biasing each plate into engagement with an adjacent plate. The tensioning mechanism **44** includes a member **46** threaded throughout the length thereof having nuts **48** located adjacent opposite end portions. The member **48** extends through enlarged openings **50** and outer plates **28** and **32**, and is threadably received within an opening **52** in intermediate plate **30**. Springs **54**, which surround member **46**, bias plates **28, 32** toward lower plate **32** which is fixed to plate **34**. The spring biasing force applied to each of plates **28** and **30**, and consequently to material **56** positioned intermediate to plates **28, 30** and/or plates **30, 32** can be varied by rotation of nuts **48**.

As can be observed most clearly from FIGS. **1** and **2**, the lowermost plate **32** is relatively flat while the ends of plates **28** and **30**, remote from fastener **40**, are slightly bowed or curved. The plates **28, 30** are curved both longitudinally and transversely adjacent the outermost ends thereof to provide contact points or pinch points **58** and **60** between plates **28, 30** and **30, 32**, respectively. As shown in FIG. **5**, the contact points **58, 60** are offset relative to each other and apply pinching or clamping forces to material positioned between the plates. The edge portions of plates **28, 30, 32** are tapered and rounded somewhat to facilitate positioning of material **56** between adjacent plates.

Additionally, the guide assembly **22** is provided with fluid actuated cylinders **62, 64** for spreading the plates **28, 30, 32** to facilitate the insertion of material **56** thherebetween. The cylinders **62, 64** are connected to a remote valve mechanism, not shown, through flexible lines **66, 68**. Cylinders **62** and **64** are fixed to plates **28** and **32**, respectively, by fasteners **70**. Fluid-actuated plunger **72** passes through opening **74** and plate **28** and is adapted to bear against central plate **30** as shown in FIG. **4**. Similarly, plunger **36** passes through opening **78** in plate **32** for engagement with plate **30**. Normally the plates **28, 30, 32** are urged toward engagement with each other adjacent contact points **58** and **60** by springs **54, 54** as shown in FIGS. **1** and **2**. However, upon actuation of plungers **72, 76** the plates are spread apart as shown in FIG. **4**. Since lower plate **32** and cylinder **64** are fixed with respect to plate **34**, displacement of plunger **76** urges central plate **30** and threaded member **46** upwardly compressing lowermost spring **54**. Furthermore, displacement of plunger **72** into engagement with central plate **30** serves to pivot plate **28** upwardly thus compreesing the uppermost spring **54**.

An arcuate plate member **80**, positioned adjacent arcuate surfaces **82** on each of plates **28** and **30**, serves as an edge guide for material being advanced to the stitching zone **16**. Arcuate guide member **80** can be adjustably positioned longitudinally with respect to plates **28, 30, 32** on bracket **84**. The bracket **84**, which is fixed relative to lower plate **32**, has a slot **88** provided therein for slidably receiving fasteners **86** which are threadably received within member **88**.

In operation of the guide assembly, the sewing machine presser foot **90** is raised and plates **28, 30, 32** are opened by actuating plungers **72, 76**. Material **56** to be sewn then is inserted between the plates, as shwon by FIGS. **4** and **5**, until the edge portions thereof roughly engage arcuate stop member **80**. Fluid pressure within cylinders **62, 64** is relieved permitting plates **28, 30, 32** to close thus gripping one layer of the material **56** at point **58** and gripping the other layer **56** at point **60**. Also, the presser foot **90** is lowered to a sewing position. During the sewing operation the edges of material **56** are accurately and automatically guided and aligned as they are displaced in a directed path of travel through the stitching zone **16**. Cutter **20** trims off any rough edge portions of the material being advanced through the stitching zone.

The edge portions of the fabric material **56, 56** are properly aligned and guided through the cooperation of feed dogs **18**, plates **28, 30, 32**, pinch points **58, 60** and stop member **80**. A torque force is applied to each layer of material **56** in the direction of arrow B for urging the material edges into engagement with stop member **80**. Stop member **80** and contact points **58, 60** are located upstream and laterally of the stitching zone **16**. Thus it can be seen that the frictional forces applied to material **56** at points **58, 60**, as the material is advanced by feed dogs **18** in direction A, applies a biasing action or torque to the material in the direction of arrow B thus sliding the material edges against stop member **80**. The material between the stop member **80** and pinch points **58, 60** is prevented from buckling and is maintained in a relatively flattened condition by plates **28, 30, 32**, and the edge portions of each layer of material are moved independently of each other in the direction of arrow B until they abut stop member **80**. As a result, the guide assembly **22** assures movement of the edge portions of one or more pieces of material to be sewn along the proper path to the stitching zone **16** even when the edges of the material are contoured.

FIGS. **6** and **7** illustrate a modified embodiment of the guide assembly. The modified assembly **10** includes a series of spaced plates **102, 104, 106** secured in assembled relation by fasteners **108, 110**. Located between plates **102, 104**, and **106** are spacer plates **112** and **114** each having an arcuate edge guiding surface **116** for directing material **56** to the stitching zone **16** of a sewing machine. Spacer plates **112, 114** function in a manner similar to stop member **80** of the embodiment of FIGS. **1** through **5** to guide the edges of material **56**.

Outermost plates **102** and **106** have portions removed therefrom to form notches **126, 128** for receiving wire spring member **118, 120**. The spring members which are supported adjacent opposite end portions of fastener **108** are biased toward plate **104** such that the end portions **122, 124** engage the top and bottom sides thereof. Thus it can be seen that material **56** positioned between plates **102, 104** and plates **104, 106** will be gripped or pinched between adjacent spring member end portions **122, 124** and plate **104**.

As material **56** is advanced in the direction of arrow A the edge portions thereof are forced to the right, as shown by FIG. **7**, until they abut the curved surfaces **116** of spacer plates **112, 114**. The material **56** moves into engagement with surfaces **116** since the spring end

portions **122, 124,** applying frictional forces separately to each material layer, are located upstream and to one side of the stitching zone **16** similarly to contact points **58** and **60** in the embodiment of FIGS. **1** through **5.**

Plates **102, 104, 106** are of different lengths and may be curved slightly adjacent the end portions remote from fastener **108** in order to facilitate insertion of material **56** therebetween. The guide assembly **100** can be adjustably positioned on a sewing machine support structure by the bracket **130** having a slot **132** provided therein for receiving conventional fasteners, not shown.

The present invention further provides a means for accurately controlling the longitudinal alignment of two or more superposed plies of material as they are advanced to a stitching zone or other work station. Normally in advancing superposed plies of material to a stitching zone, the feed dogs tend to advance the lowermost ply of material slightly faster than the other ply or plies which results in a longitudinal shifting of the plies relative to each other during the sewing operation. The advancing plies of material are controlled to maintain them in longitudinally aligned relationship by varying forces applied individually to each ply of material to retard advancement to the stitching zone. For example, the tension or retarding effect applied to the lowermost ply of material by plates **30, 32** and contact point **60** may be increased by adjusting the pressure applied by spring **54** such that the plies of material are advanced at the same rate.

We claim:

1. The method of controlling and aligning edge portions of flexible material comprising the steps of: advancing material by applying a prescribed linear force to the material, clamping the material with a predetermined force to apply a torque to the material as the material is advanced, displacing the material in a preselected direction in response to the torque applied thereto, and limiting the displacement of the material responsive to the torque beyond a specified location to guide edge portions of the material.

2. The method as defined in claim **1,** wherein the material is clamped at a prescribed location spaced upstream and laterally of the linear force.

3. The method as defined in claim **1,** and further including the step of maintaining portions of the material adjacent the guided edge portions in an unbuckled and substantially flattened condition.

4. Apparatus for controlling and guiding an edge portion of at least one work piece comprising: means for supporting and retaining a work piece in a generally flattened and unbuckled condition adjacent an edge portion to be guided, means for applying a force to a work piece sufficient to displace the work piece edge portion in predetermined direction, and means for limiting displacement of a work piece in said predetermined direction by engaging the edge portion thereof.

5. Apparatus as defined in claim **4,** wherein the edge portions of a plurality of work pieces may be guided simultaneously and independently.

6. Apparatus as defined in claim **4,** said supporting and retaining means including a plurality of superposed plates, and adjacent plates being positioned to receive a work piece therebetween.

7. Apparatus as defined in claim **4,** wherein said force applying clamping means includes arcuate means biased into engagement with the work pieces at prescribed locations.

8. Apparatus as defined in claim **4,** wherein said work piece limiting means includes an adjustable stop member for restricting displacement of one or more work pieces beyond a predetermined location.

9. Apparatus as defined in claim **4,** wherein said supporting and retaining means and said force applying means cooperate with said displacement restricting means to align and control independently a plurality of work pieces.

10. Apparatus as defined in claim **6,** further including means for displacing said superposed plates to an opened position to facilitate the insertion of work pieces therebetween.

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