United States Patent [19]

Vasilantone

[11] **3,863,368**

[45] **Feb. 4, 1975**

[54] **EXPANDER, DEVICE FOR STRETCHING A FABRIC SHEET**

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[22] Filed: **Apr. 24, 1972**

[21] Appl. No.: **246,697**

[52] **U.S. Cl.** **38/102.5,** 38/102.91

[51] **Int. Cl.** **D06c 3/08**

[58] **Field of Search** 26/54; 38/102.5, 102.6, 38/102.91; 160/374, 374.1

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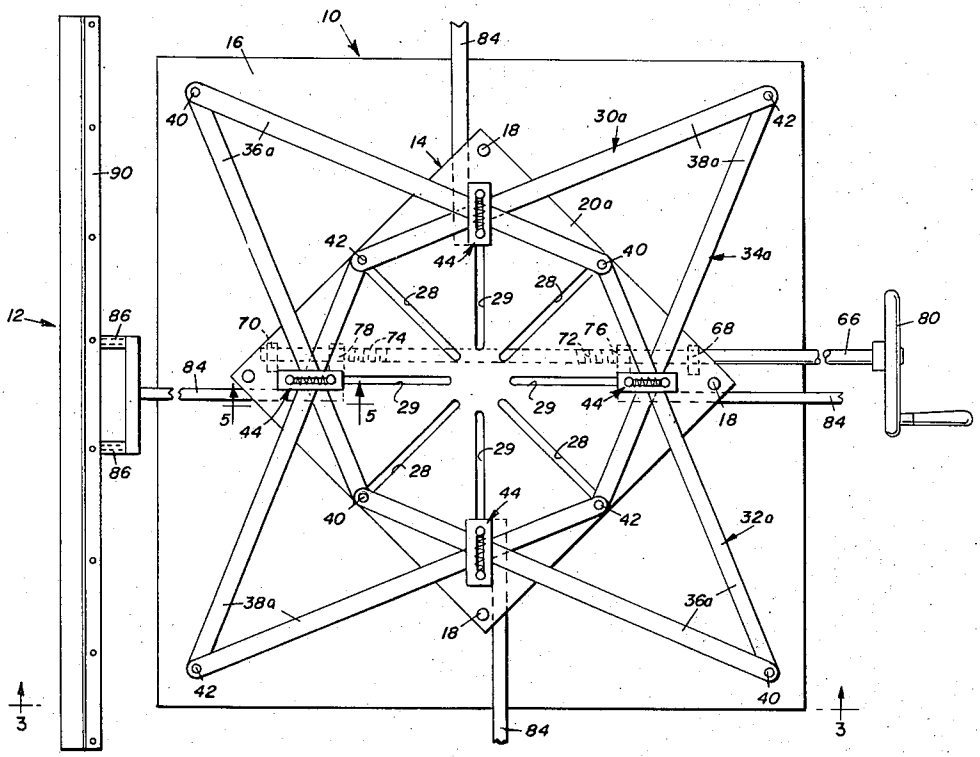
[57] **ABSTRACT**

An expander device for stretching a fabric sheet comprising linkage assemblies which expand and contract in response to the input of a drive means. Fabric gripping elements are connected to the linkage assembly and move linearly as said linkage expands and contracts.

6 Claims, 7 Drawing Figures



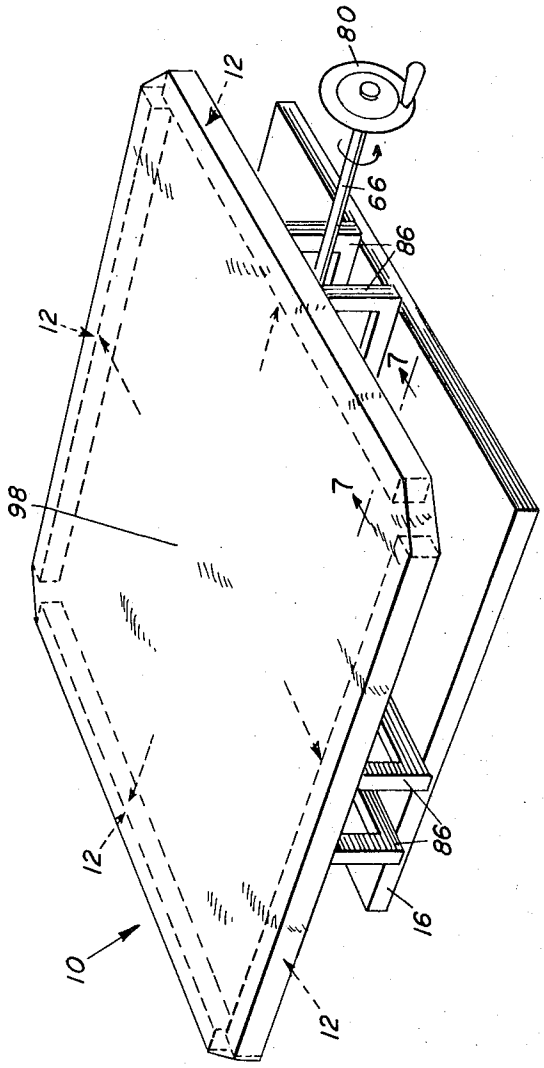

80
12
66
86
12
7
7
98
12
86
16
10
12

FIG. 1

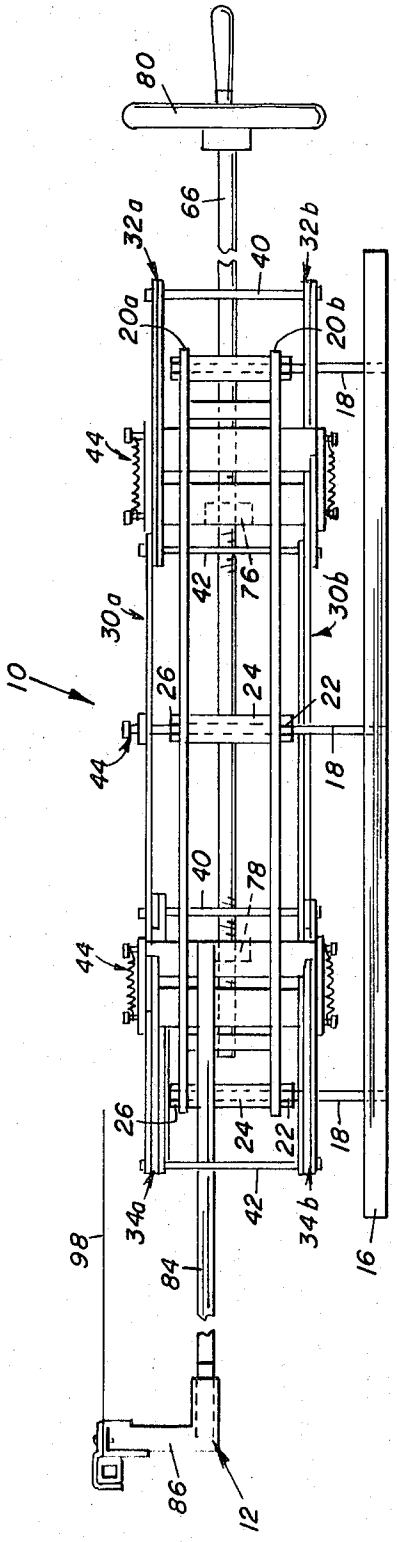
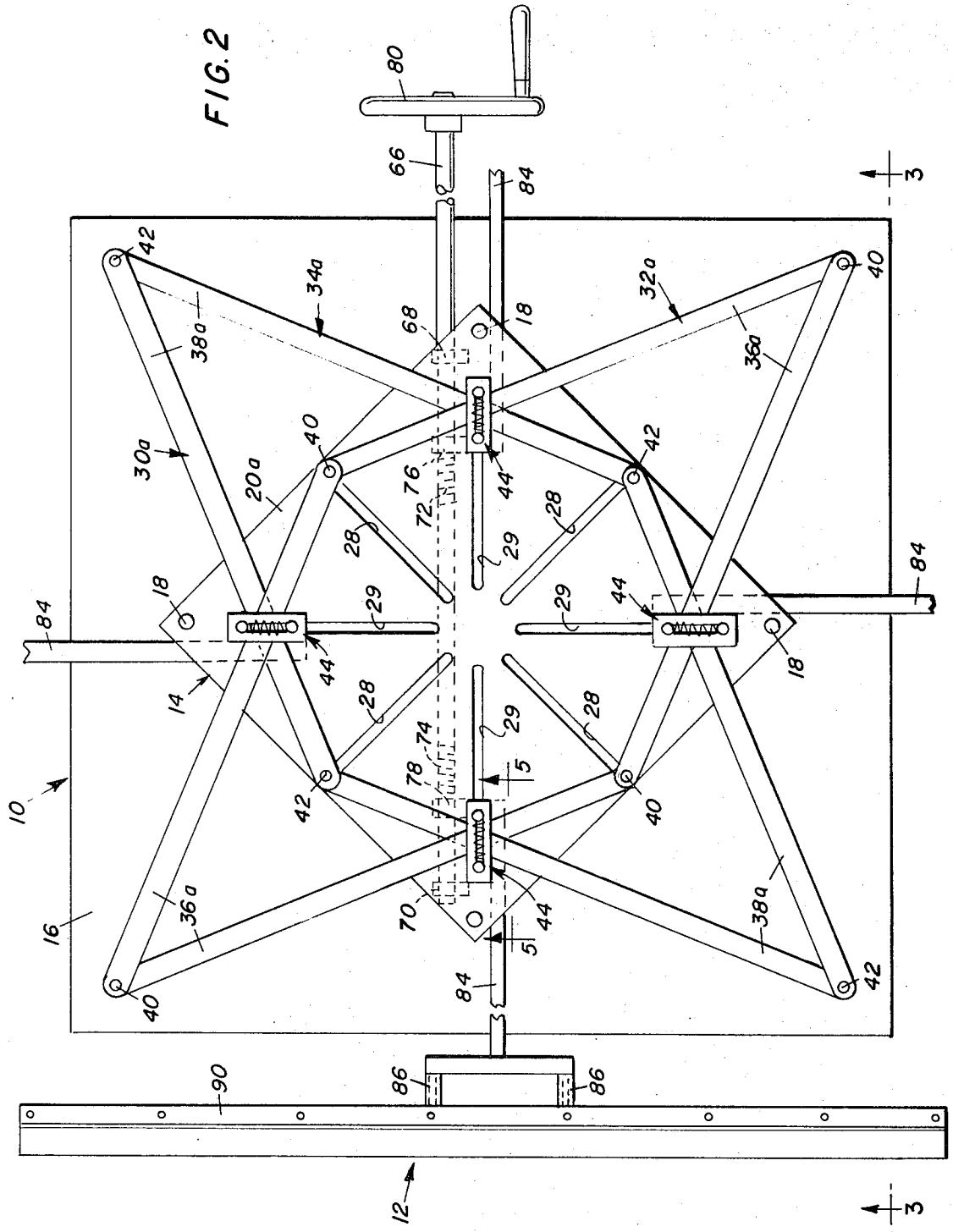

80
66
32a
32b
40
20a
20b
18
44
42
76
30a
30b
10
26
24
22
44
18
40
78
44
26
24
22
18
34a
42
34b
98
84
16
86
12

FIG. 3

FIG. 2


80
66
84
3
42
34a
38a
68
18
32a
40
36a
30a
20a
40
42
76
72
44
28
28
29
29
29
84
18
84
44
44
18
14
28
28
74
29
78
5
10
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36a
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5
84
42
40
90
86
86
12
3

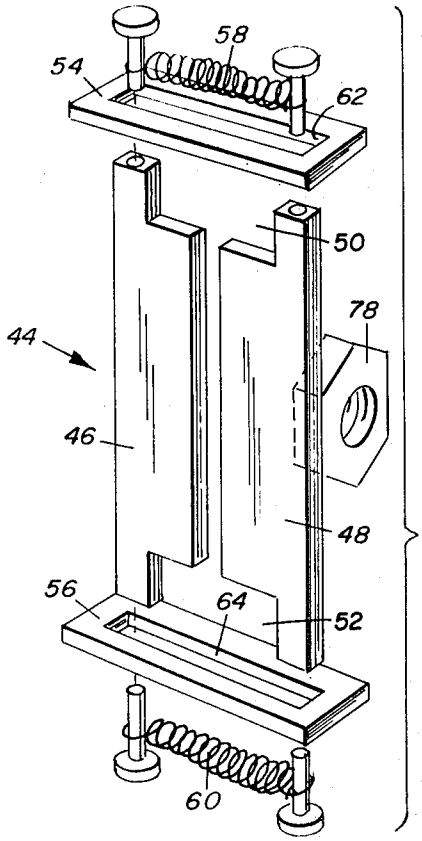

FIG. 4

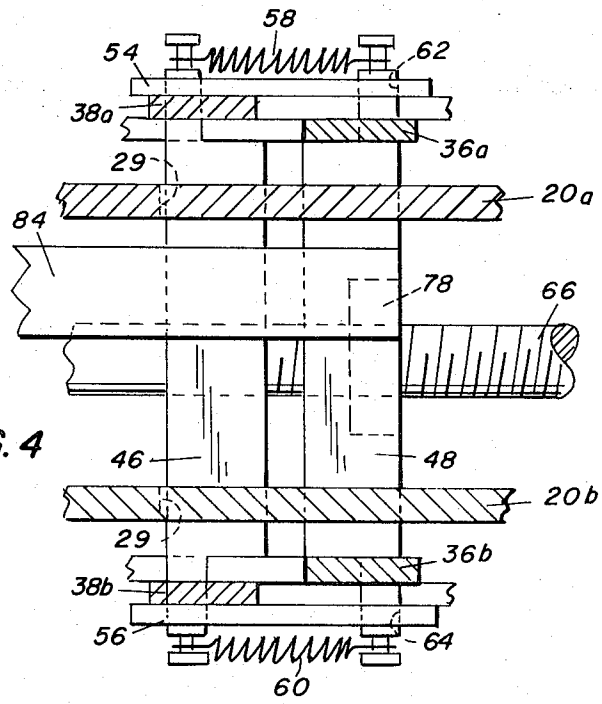

FIG. 5

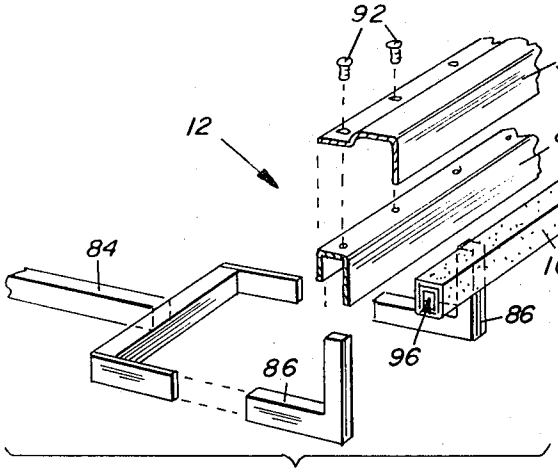

FIG. 6

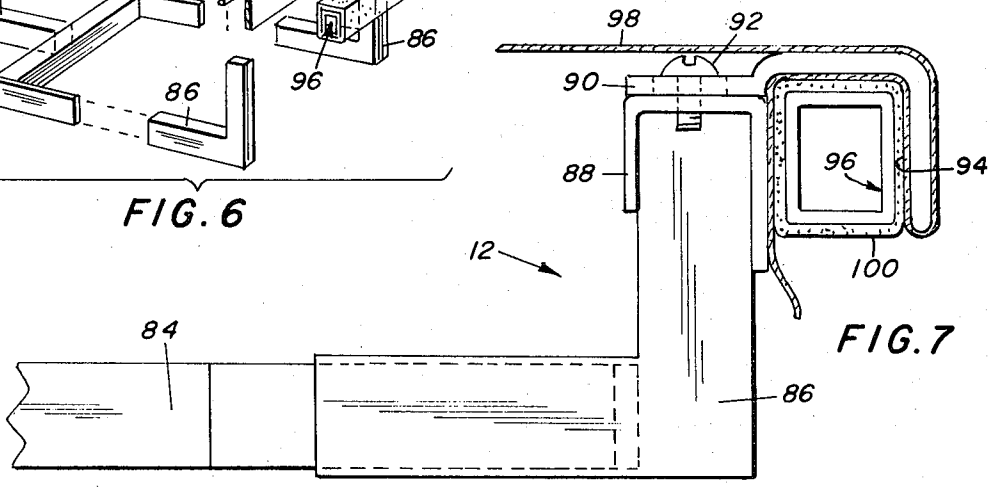

FIG. 7

EXPANDER, DEVICE FOR STRETCHING A FABRIC SHEET

This invention relates to an expander and, in particular, an expander for stretching flexible sheets such as textile fabrics in a plurality of different directions simultaneously and equally.

Fabric stretchers per se are not new to the prior art;; however, the prior art devices are generally unsatisfactory to the extent that they are unable to maintain uniformity and stability in the fabric during the stretching operation. The result is that the non-uniformly stretched fabrics may present "soft spots". A particular application for an expander device of the type disclosed herein is in stretching fabric used as stencil screens in screen printing processes. The expander of this invention is used to stretch the fabric uniformly after which a frame is placed on the fabric and the fabric is attached thereto by any conventional means. The expander then releases the material but that portion attached to the frame remains taut and wrinkled free. Of course, the invention is not limited to the assembly of stencil screen frames.

Accordingly, it is an objective of this invention to provide an expander device for uniformly stretching a flexible sheet material such as a textile fabric in a plurality of different directions equally and simultaneously.

It is a further objective of this invention to provide an expander apparatus which is operable by a single drive means.

It is a further objective of this invention to provide an expander apparatus which is readily adjustable to accommodate fabric panels of different sizes.

It is a further objective of this invention to provide an expander apparatus which exerts great stretching forces relative to the level of force input.

More particularly, it is an objective of this invention to provide an expander device for stretching fabrics comprising a framework, and fabric gripping expander elements mounted on the framework for reciprocatory movement in an outward radial direction relative to the center of the framework. Guide means are provided in the framework for guiding the elements in their outward movement. The means for moving the elements comprises an expandible linkage system connecting each of said elements, and drive means for expanding the linkage system thereby reciprocating said elements outwardly simultaneously and equally. In a preferred embodiment, the drive means is a threaded, rotatable shaft having axially spaced, oppositely threaded positions thereon, threadedly received in nuts mounted at spaced points on said linkage means whereby said nuts are caused to move toward and away from each other upon rotation of the threaded shaft to contract and expand said linkage means. The linkage means in the preferred embodiment comprises two linkage assemblies each having first and second linkage sections. Each of the sections comprises four elongated bars of equal length pivotally connected to each other and normally assuming a rhombus shape when in place on said framework. The second section of each of said assemblies overlies the first section with its major axis extending transversely to the major axis of the first section. Connecting means are provided for loosely joining the sections at their points of overlap.

These and other objects of the invention will become more apparent to those skilled in the art by reference

to the following detailed description when viewed in the light of the accompanying drawings wherein:

FIG. **1** is a perspective view of the expander of this invention, having thereon a fabric to be stretched;

FIG. **2** is a plan view of the device of FIG. **1**;

FIG. **3** is a view taken on line **3—3** of FIG. **2**;

FIG. **4** is an exploded view of one of the driving posts of this invention;

FIG. **5** is a view taken on line **5—5** of FIG. **3**;

FIG. **6** is an exploded view of a fabric gripping element; and

FIG. **7** is a cross sectional view taken on line **7—7** of FIG. **1**.

Referring now to FIG. **1**, the expander apparatus of this invention is generally indicated by the numeral **10** and includes four, equally, radially spaced fabric gripping elements **12** which are mounted on a framework generally indicated by numeral **14** for uniform and simultaneous reciprocatory movement in the direction of the arrows.

The mechanism by which the elements **12** are shifted is more fully understood with reference to FIGS. **2** and **3**. The expander is attached to any suitable base **16** by means of mounting pins or any other suitable mounting means **18**. The framework **14** consists of a pair of vertically spaced plates **20***a* and **20***b*. The plates are supported by the mounting pins **18** each of which includes an annular flange on which may be threaded nut or the like **22** for abutting the undersurface of the plate **20***b*. A spacer sleeve **24** is mounted on each of the pins and supports the upper plate **20***a* in spaced relationship relative to the lower plate **20***b*. Each of the mounting pins is headed at **26** whereby the plates are securely held in spaced relationship. The plates are identical in construction and, as best seen in FIG. **3**, include a plurality of radially disposed guide slots **28**. A pair of linkage assemblies generally indicated by the numerals **30***a* and **30***b* are positioned adjacent plates **20***a* and **20***b*. The linkage assemblies are identical, therefore, only one **30***a* will be described in detail, and can best be understood with reference to FIGS. **2** and **3**. The linkage assembly **30***a* consists of first and second linkage sections **32***a* and **34***a*. The linkage sections are identical and each comprises four elongated metal bars or straps **36***a* and **38***a*, respectively. The straps of the respective upper and lower linkage sections **30***a* and **30***b* are joined together at their outer ends in a pivotal connection by means of pins **40** and **42** respectively, to each form a polygon which, as shown in FIG. **3**, normally assumes the shape of a rhombus when in place on the framework **14**. The section **34***a* underlies the section **32***a* and is angularly oriented relative to section **32***a* such that the major axis of section **34***a* extends transversely of the major axis of the section **32***a*.

The pins **40** and **42** pivotally connect the straps of the linkage assembly **30***b* in the same manner as shown in FIG. **3** for linkage assembly **30***a*. The pins are suitably keyed to their respective straps to prevent axial movement thereof and dislodgement from the openings in the straps. Further, the pins defining the end points of the minor axis of each of the linkage sections of the respective linkage assemblies ride in guide slots **28** as best seen in FIG. **3**, the slots limit both the inward and outward movement and insure correct linear movement of the respective pivotal connection. It can be seen that by means of these pivot pins and by means of the aligned slots in plates **20***a* and **20***b* of the framework, when the

lower linkage assembly is moved radially inwardly and outwardly in the slots, the upper linkage assembly moves in an identical manner.

The linkage sections of the respective linkage assemblies **30***a* and **30***b* are connected together at their points of intersection by means of connector posts **44** which are best shown in FIGS. **4** and **5**. The posts **44** comprise a pair of cooperating side members **46** and **48** which when placed together define upper and lower strap receiving slots **50** and **52**, respectively. The width of the slots **50** and **52** is sufficient to permit the maximum amount of relative pivotal movement between the superposed straps as defined by the amount of movement permitted by guide slots **28**. The posts ride in guide slots **29** which are disposed between the guide slots **28**. The side members **46** and **48** are held together by means of locking elements **54** and **56** on the upper and lower ends thereof, respectively. Additionally, tension springs **58** and **60** are looped over the upper and lower ends of the members **46** and **48** and further help hold the sections together while permitting expansion, within the limits permitted by the slots **62** and **64** in the locking members **54** and **56**, respectively.

Drive means in the form of a threaded shaft **66** is rotatably journalled in blocks **68** and **70** disposed between the upper and lower plates **20**a and **20***b*. The blocks permit rotational movement of the shaft but prevent axial movement thereof. The shaft has right-and left-hand threaded sections **72** and **74** disposed on either side of the center point of the framework. First and second nuts **76** and **78** are fixedly connected to a pair of diametrically opposed connector post **44** and threadedly receive the threaded portions **72** and **74** of the shaft **66**. The shaft is provided with a crank handle **80** to enable manual rotation thereof. It can be seen that as the shaft is rotated by means of the crank **80**, the posts **44** to which the nuts **76** and **78** are attached will move toward or away from each other depending on the direction of rotation of the shaft. The movement of the posts is transmitted by means of the straps of the linkage section to those posts which are not connected to the nut to effect an equal and simultaneous movement of those posts. In other words, the linkage sections of the linkage assemblies will contract and expand equally within the limits defined by the guide slots in the upper and lower plates **20***a* and **20***b* of the framework **14**. It is to be understood that power means can be utilized to drive the threaded shaft **66** in lieu of the crank handle **80**.

Gripping elements generally indicated by the numeral **12** are mounted on the outer end of the T-shaped elongated rods **84** which are mounted to the posts **44** by welding or other suitable means, and are equally radially spaced from each other. The gripping elements **12** as best seen in FIG. **6** and FIG. **7** each comprise a pair of "L"-shaped supporting bars **86** telescopically mounted on the outer ends of rods **84**. The "L"-shaped bars **86** support an elongated channel member **88** on their upper ends and further receive a locking channel member **90** with both the members **88** and **90** being affixed to the brackets **86** by means of pin fasteners **92** or the like. The channel member **90** along with the member **88** defines an inverted channel **94** which receives an elongated locking tube **96** for frictionally clamping fabric **98** between the outer surface of the locking tube **96**, the inner surface of the channel member **90** and the outer surface of the member **88**. The locking tube **96** is preferably coated with a friction surface **100** such as rubber or other elastomeric gripping material.

In operation, it can be seen that a panel to be stretched is placed over the expander apparatus **10** and the edges thereof are locked in the gripping elements **12** by means of the locking tube **96** and the channel member **90** as described above. The linkage assemblies **32***a* and **34***a* will, of course, be in their collapsed position or in other words, in the position wherein the pins and posts are at the inner ends of the guide slots **28** and **29**. The crank **80** is then rotated causing the linkage sections to expand in the manner heretofore described such that the fabric-engaging members **82** are moved radially outwardly equally and simultaneously to uniformly stretch the fabric attached thereto. In a general manner, while there has been disclosed an effective and efficient embodiment of the invention, it should be well understood that the invention is not limited to such embodiment as there might be changes made in the arrangement, disposition, and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

I claim:

1. An expander device for stretching fabrics comprising a framework, a linkage system on said framework comprising a pair of parallelogram linkage sections each having major and minor axes, each parallelogram linkage section comprising bars connected to each other for relative pivotal movement, said sections being vertically stacked and angularly disposed relative to each other such that the major axis of one of said sections extends generally transversely to the major axis of the other, said stacked sections defining points of overlap, said framework including a plurality of radially extending guide means slidably mounted therein, the bars of overlapped linkage sections engaging with said guide means at said points of overlap, fabric gripper elements mounted for movement with said guide means and extending outwardly therefrom, drive means operably connected to a single opposed pair of guide means for expanding and contracting said linkage system, said guide means providing for controlled uniform and simultaneous movement of said gripper elements toward and away from the center of said framework.

2. The expander of claim **1** wherein said drive means comprises a threaded rotatable shaft, and nut means on said opposed pair of guide means for threadedly receiving said shaft.

3. The expander of claim **1** and including a second pair of linkage sections of identical construction with the first pair of linkage sections and vertically spaced relative to the first pair, and a plate disposed between said vertically stacked pairs of sections, and wherein said guide means connect said pairs of sections at said points of overlap, said plate having radially extending slots therein for slidably receiving said guide means.

4. The expander device of claim **3** wherein each of said guide means includes a vertically extending elongated member having a recess at each end thereof, the portions of said linkage sections of each pair of said points of overlap being received in said recesses, and retainer means for maintaining said portions in said recesses.

5. The expander of claim I wherein each of said gripper elements includes an elongated member having a

channel therein extending perpendicular to the direction of movement of said gripper elements, and an elongated locking bar snuggly received in the channel of said member and clamping the edges of a fabric to be stretched between said bar and the walls of said channel.

6. The expander device of claim 1 wherein said framework comprises a plate having radially extending slots therein.

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