United States Patent [19]

Lawson

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[45] **July 2, 1974**

[54] **PLEATING APPARATUS**

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[52] **U.S. Cl.** **223/28**

[51] **Int. Cl.** **A41h 43/00,** D06j 1/00

[58] **Field of Search** ..... 223/28–35; 33/192, 180 R, 174 R, 174 G, 137; 112/132–136, 144–146

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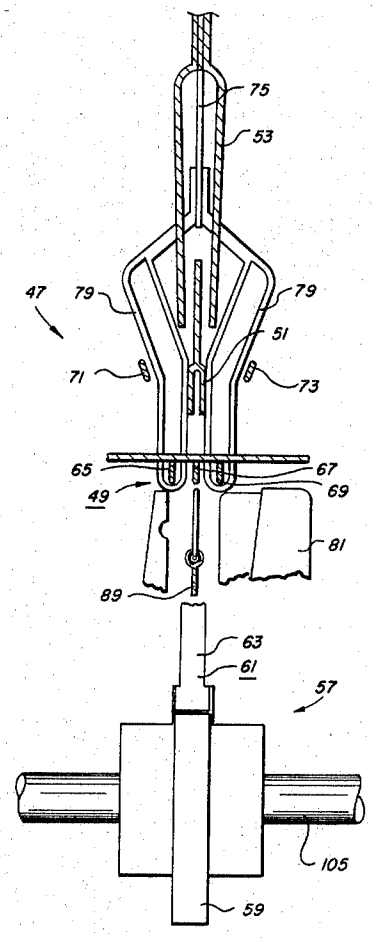
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[57] **ABSTRACT**

An apparatus for use in the manufacture of the pleated upper section of a drapery panel. The apparatus includes a computing device for determining the required pleat size and space size from a given hemmed width size and a given number of pleats desired in the finished drapery panel to obtain a given finished width of the drapery panel and includes a plurality of pleat forming devices for evenly spacing, folding and tacking a plurality of pleats in the upper section of the drapery panel in accordance with the computations of the computing device.

18 Claims, 11 Drawing Figures



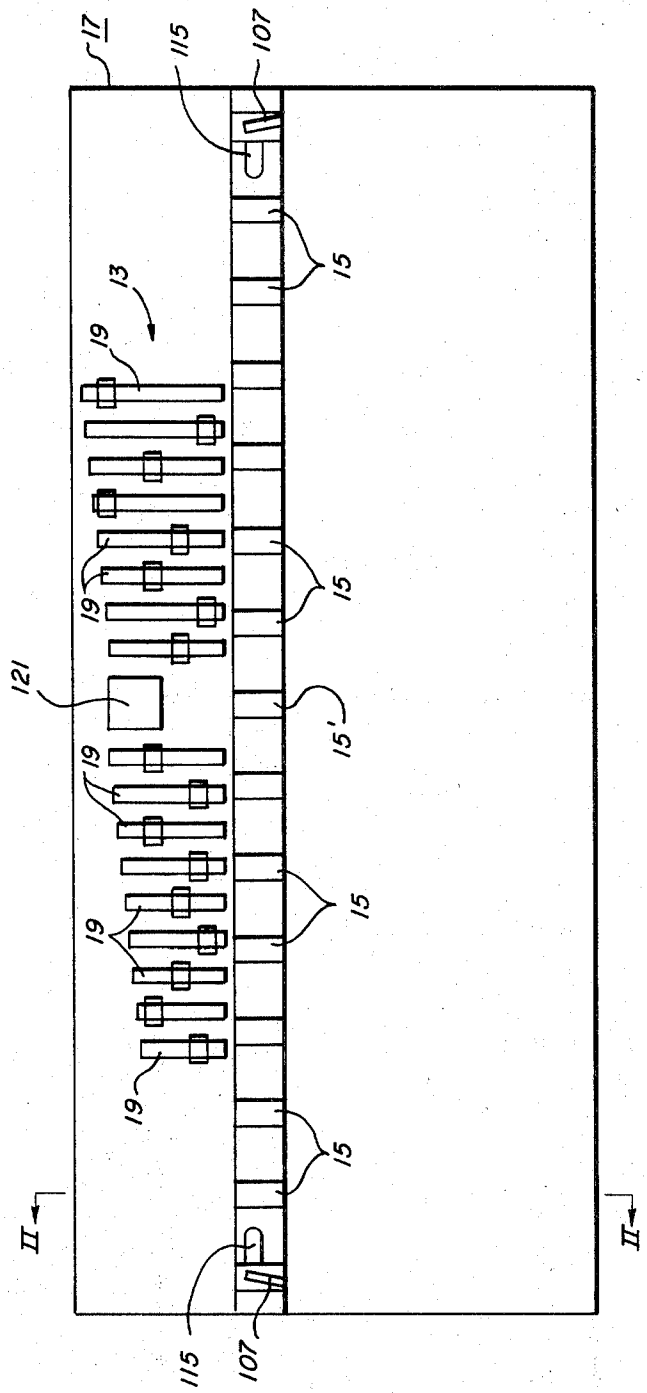


FIG. 1

FIG. 3

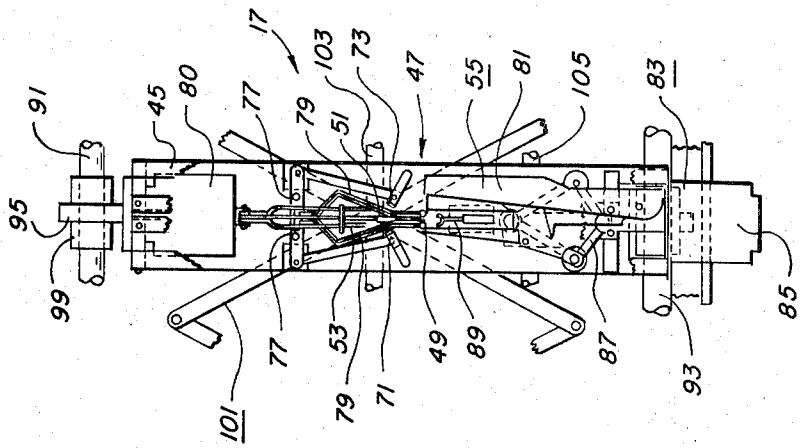

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FIG. 2

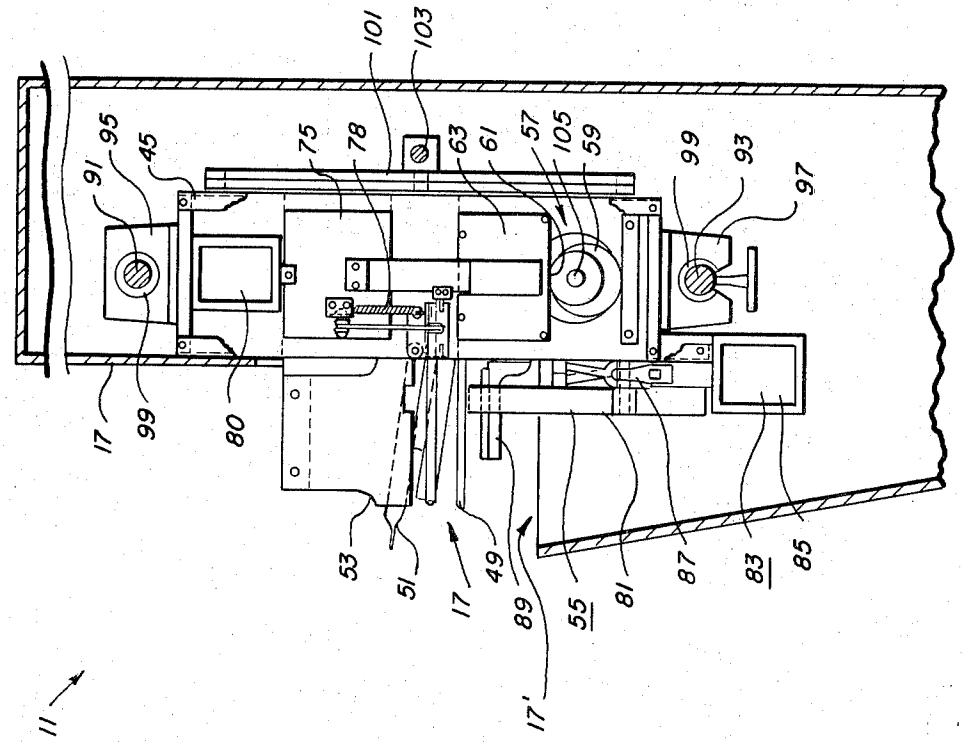

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FIG. 4

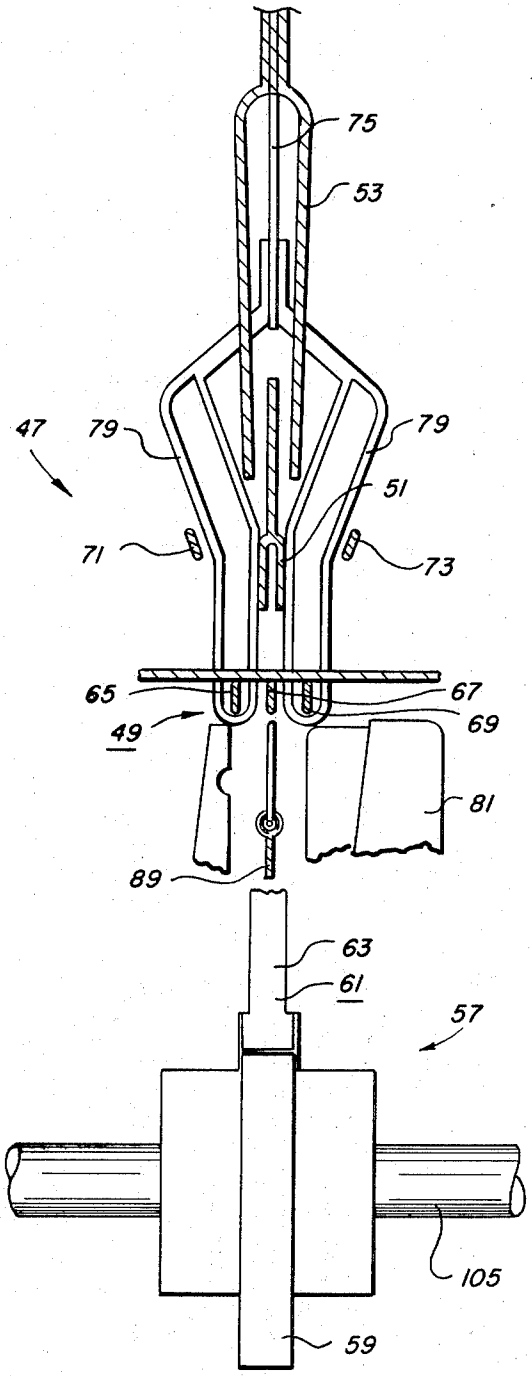


FIG. 5

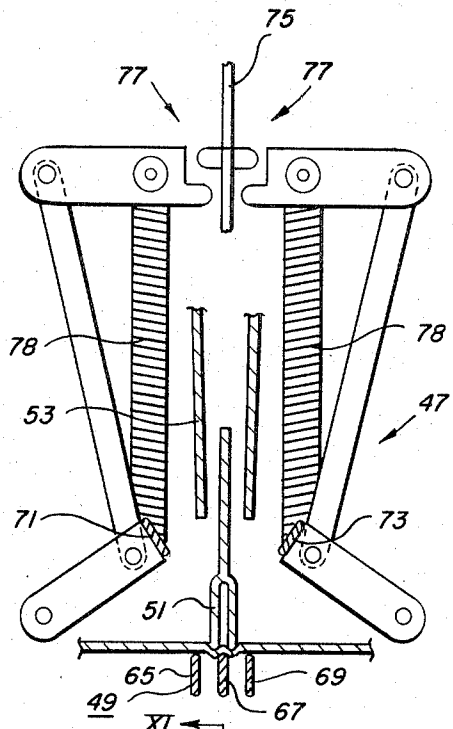


FIG. 10

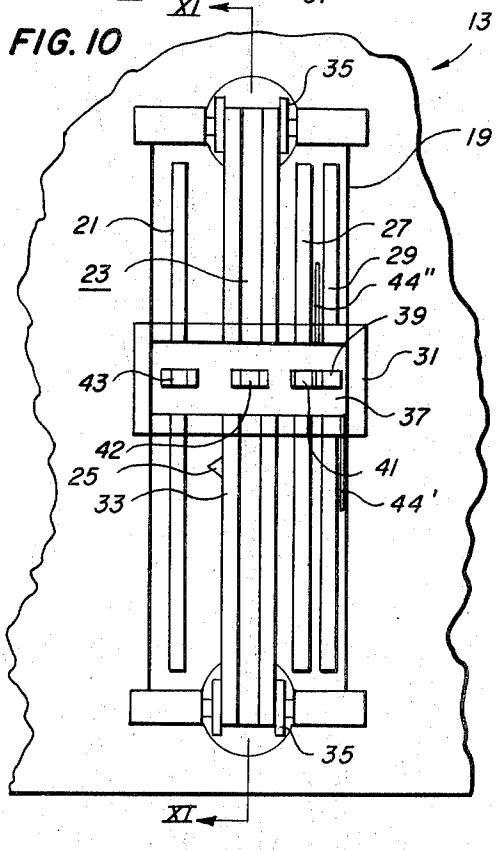


FIG. 6

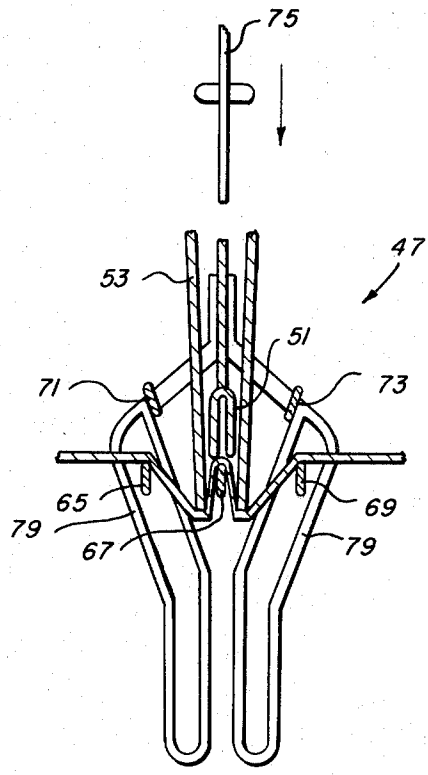


FIG. 11

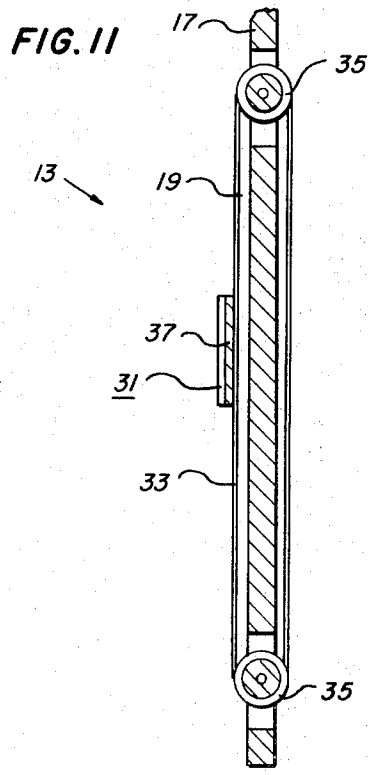


FIG. 7

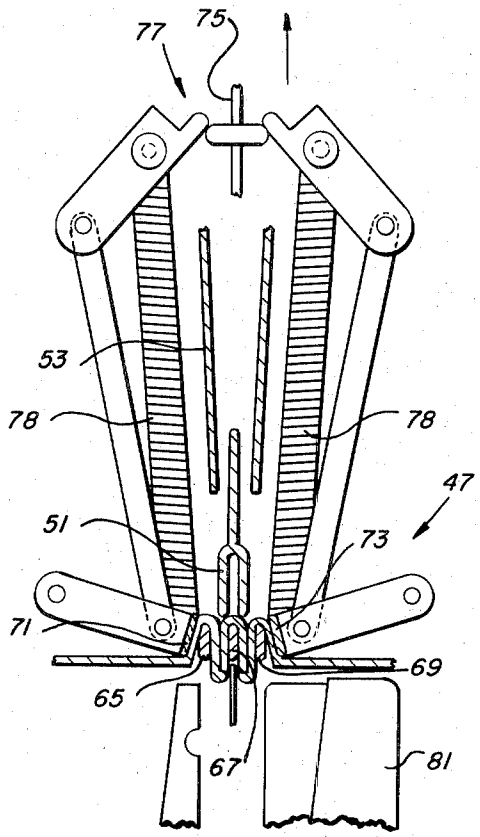


FIG. 8

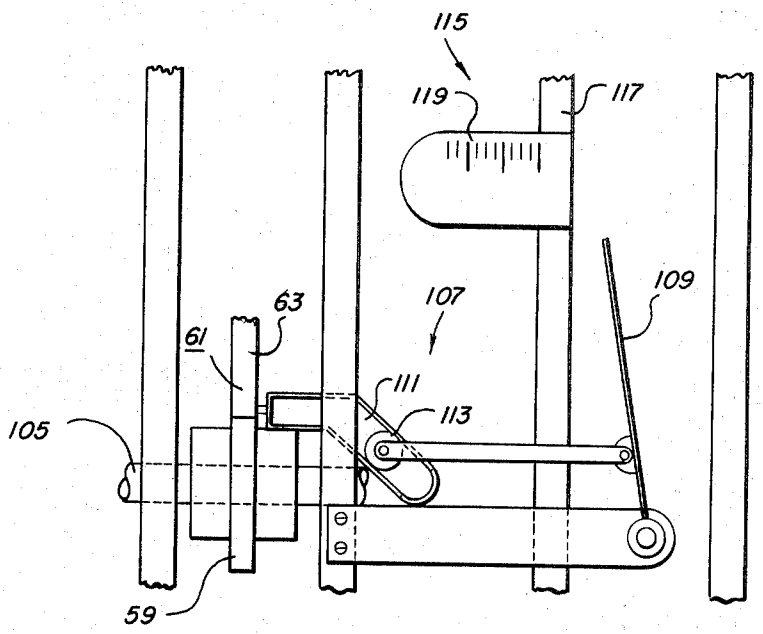
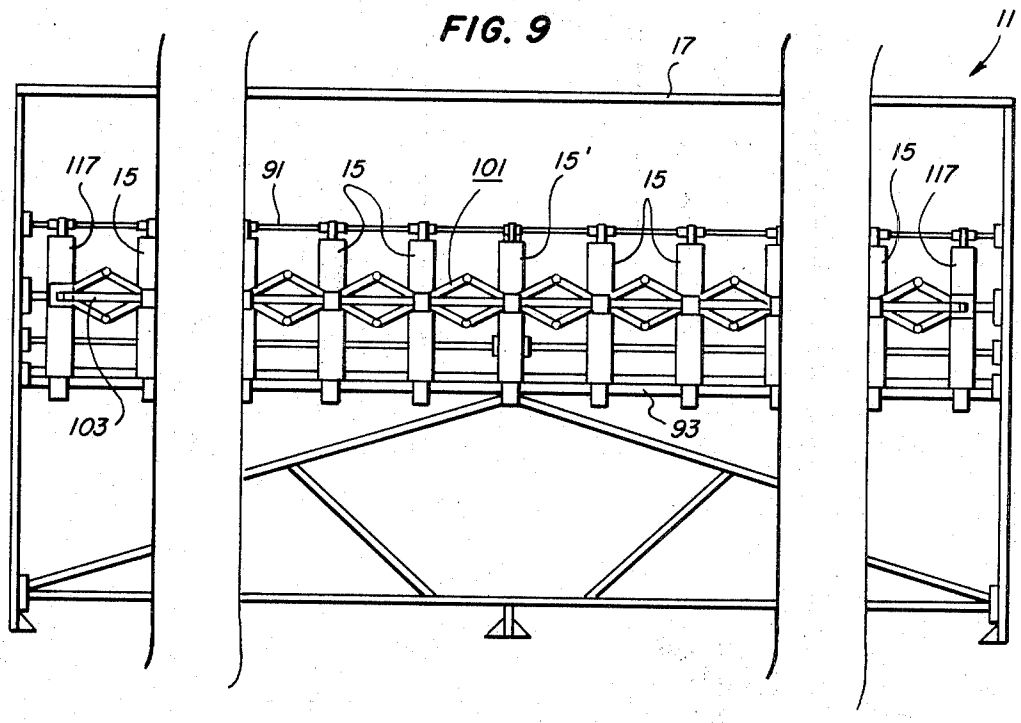

115
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117
109
107
63
61
111
113
105
59

FIG. 9


17
11
117
15
91
15
101
15'
15
15
117
103
93

PLEATING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates generally to devices for use in the manufacture of pleated drapery panels.

2. Description of the Prior Art

The following U.S. Patents are known to relate to the present invention: Heyer, U.S. Pat. No. 74,533; Hedges, U.S. Pat. No. 532,199; Hilton, U.S. Pat. No. 944,094; Heap, U.S. Pat. No. 1,451,220; Krell et al., U.S. Pat. No. 1,607,131; Strube, U.S. Pat. No. 2,115,593; Gellman, U.S. Pat. No. 2,669,955; Matt, U.S. Pat. No. 2,777,617; Ogle, U.S. Pat. No. 2,834,522; Carrigan, U.S. Pat. No. 2,879,927; Windham, U.S. Pat. No. 2,948,241; Schiavone, U.S. Pat. No. 3,029,004; and Packer et al., U.S. Pat. No. 3,166,854. None of the above patents disclose or suggest the present invention.

Heretofore, the pleated upper sections of drapery panels have been formed by:

1. marking each pleat and space by hand or by using a device such as disclosed in the Packer et al., U.S. Pat. No. 166,854 patent,

2. folding each pleat by hand or by using a device such as disclosed in the Gellman U.S. Pat. No. 2,669,955 patent, and

3. manually tacking the folded pleats together.

These known prior methods are disadvantageous in that they are time-consuming, laborious, and inconsistent.

SUMMARY OF THE INVENTION

The present invention is directed towards overcoming the problems and disadvantages in the manufacture of the pleated upper sections of drapery panels. The concept of the present invention is to provide an apparatus comprising a computing device for determining the required pleat size and space size from a given hemmed width size of a drapery panel and a given number of pleats desired in the finished drapery panel to obtain a given finished width of the drapery panel and comprising a plurality of pleat forming devices for evenly spacing, folding and tacking a plurality of pleats in the upper section of the drapery panel in accordance with the computations of the computing device without stretching the fabric of the drapery panel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat diagrammatic front view of the pleating apparatus of the present invention.

FIG. 2 is a sectional view as taken on line II—II of FIG. 1 with some parts removed for clarity.

FIG. 3 is a front view of FIG. 2 with some parts removed for clarity.

FIG. 4 is a somewhat diagrammatic view of a portion of one of the plurality of pleat forming devices at a first stage in the folding process.

FIG. 5 is a view similar to FIG. 4 showing a second state of the folding process.

FIG. 6 is a view similar to FIG. 5 showing a third stage of the folding process.

FIG. 7 is a view similar to FIG. 6 showing a fourth stage of the folding process.

FIG. 8 is somewhat diagrammatic view of a portion of the present invention showing the overlap marker means and the add-on gauge means in detail.

FIG. 9 is a somewhat diagrammatic view of the back of the pleating apparatus of the present invention with some parts removed for clarity.

FIG. 10 is a detail view of one of the plurality of scales of the computing device of the present invention.

FIG. 11 is a sectional view as taken on line XI—XI of FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The pleating apparatus **11** of the present invention is for use in the manufacture of the pleated upper sections of drapery panels. The pleating apparatus **11** includes a computing device **13** for determining the required pleat size and space size from a given hemmed width size of a drapery panel and a given number of pleats desired in the finished drapery panel to obtain a given finished width of the drapery panel; a plurality of pleat forming devices **15** for evenly spacing, folding and tacking a plurality of pleats in the upper section of the drapery panel in accordance with the computations of the computing device **13**; and a housing **17** having a bin **17'**.

The computing device **13** consists of a plurality of scales **19**. Each of the scales **19** of the computing device **13** corresponds to a specific number of pleats in a finished drapery panel. For example, the computing device **13** preferably includes one such scale **19** for **5** pleats, another such scale **19** for **6** pleats, and so on. Each of the plurality of scales **19** includes a first column **21** of numerical indicia corresponding to the hemmed width of various drapery panels; a second column **23** of numerical indicia corresponding to the pleat side of various drapery panels, the second column **23** being movable relative to the first column **21**; a pointer **25** fixedly mounted intermediate of the second column **23** and movable therewith relative to the first column **21** for alignment with a given numerical indicium of the first column **21**; a third column **27** of numerical indica corresponding to the space size of various drapery panels; a fourth column **29** of numerical indicia corresponding to the finished width of various drapery panels; and a movable cursor **31** for alignment with the desired finished width indicium of the fourth column **29** to show the necessary space size indicium of the third column **27** and the necessary pleat size indicium of the second column **23** when the pointer **25** is set on the given hemmed width indicium of the first column **21**. It should be noted that the second column **23** is made movable relative to the first column **21** by any means known to those skilled in the art. For example, the second column **23** may consist of an endless tape **33** running between two wheels **35** rotatably mounted on the housing **17** of the pleating apparatus **11**. The movable cursor **31** preferably consists of an opaque body portion **37**, a first window portion **39** for allowing the desired finished width indicium of the fourth column **29** to be read therethrough, a second window portion **41** for allowing the necessary space size indicium of the third column **27** to be read therethrough, and a third window portion **42** for allowing the necessary pleat size indicium of the second column **23** to be read therethrough when the pointer **25** is set on the given

hemmed width indicium of the first column **21.** An optional fourth window portion **43** may be provided on the movable cursor **31** to aid in making sure the pointer **25** is perfectly aligned on the given hemmed width indicium of the first column **21.** In other words, after the pointer **25** is set on the given hemmed width indicium of the first column **21,** the cursor **31** is positioned with the fourth window portion **43** thereover to give a more limited view of the setting of the pointer **25** relative to the hemmed width indicium of the first column **21.**

In addition, the scales **19** preferably include "fullness" indicia for quick selection of the more popular "fullness" values of finished drapery panels. The term "fullness" relates to the ratio between pleat size and space size. More specifically, standard "fullness" relates to an approximately 50/50 ratio between pleat size and space size and may be indicated on the scales **19** by certain indicia markings **44'**. Extra "fullness" relates to an approximately 55/45 ratio between pleat size and space size and may be indicated on the scales **19** by a certain indicia marking **44''**. The indicia markings **44'**, **44''** are preferably of different colors or the like to make them easily distinguishable.

It will be understood that the reason that a plurality of scales **19** are provided, rather than or example a single scale **19,** is because of the following: (1) It would be unwieldy. (2) It is easier to read with a plurality of scales. (3) It provides a means for making a comparison between contemplated settings to decide on an optimum setting and without having to remember figures. For example, a particular setting may be made on one of the scales **19,** and then another setting made on another of the scales **19.** Then the two sets of figures may be compared to decide at a glance on the particular one to use. (4) It is necessary for each scale to be different from other scales according to the number of pleats desired, and according to the number of spaces. In summary, by having a plurality of scales **19** it gives you all of the mathematical possibilities that will be encountered to cover a full range of desired fullness.

Each of the plurality of pleat forming devices **15** is movable one relative to the other. Preferably, the center pleat forming device **15'** is fixedly anchored to the housing **17** of the pleating apparatus **11** (see FIG. **9**). Each of the plurality of pleat forming devices **15** includes a frame **45,** folding means **47** mounted on the frame **45,** and tacking means **55** mounted on the frame **45** for fixedly fastening pleats together after they have been folded by the folding means **47.** The folding means **47** includes finger means **49** for supporting the section of the drapery panel to be pleated. The finger means **49** preferably includes a first finger member **65,** a second finger member **67,** and a third finger member **69.** Clamp means **51** is included in the folding means **47** to hold the section of the drapery panel to be pleated against the second finger member **67.** The folding means **47** also includes a fork means **53** to force the section of the drapery panel to be pleated around the second finger member **67** to form a pleat. The folding means **47** preferably includes adjustment means **57** for moving the finger means **49** relative to the fork means **53** to allow the size of the pleats to be formed to be varied. The adjustment means **57** preferably comprises a cam member **59** and a cam follower member **61.** The cam follower member **61** consists of a first slidable plate **63** slidably mounted from frame **45** by suitable means for vertical movement, onto which the finger means **49** is mounted and onto which the clamp means **51** is pivotally mounted above the finger means **49.** The folding means **47** preferably includes first and second outside arm members **71, 73.** The first and second outside arm members **71, 73** coact with the fork means **53** to force the section of the drapery panel to be pleated around the first, second and third finger members **65, 67, 69** to form a triple fold pleat. The fork means **53** of the folding means **47** is mounted on a second slidable plate **75,** slidably mounted from frame **45** by suitable means for vertical movement. The first and second outside arm members **71, 73** are pivotally mounted on the frame **45** and are activated by striker means **77** mounted on the second slidable plate **75.** The first and second outside arm means **71, 73** are provided with return springs **78** to reposition the first and second outside arm means **71, 73** after they have been activated by the striker means **77.** Finger cam means **79** are preferably fixedly mounted on the second slidable plate **75** for spreading the first and third finger members **65, 69** to assist in the formation of triple fold pleats. The folding means **47** includes a first electric solenoid **80** for activating the second slidable plate **75** to cause the fork means **53** to force the section of the drapery panel to be pleated around the second finger member **67** of the finger means **49** to form a pleat.

The tacking means **55** includes a stapler means **81** for stapling pleats together after they have been formed by the folding means **47** and includes stapler actuating means **83** for operating the stapler means **81** coactively with the folding means **47.** The stapler actuating means **83** includes a second electric solenoid **85** attached to the stapler means **81** through a scissors-like member **87.**

Each of the plurality of pleat forming devices **15** optionally includes a pin strip holding member **89** mounted on the frame **45** for holding a pin strip adjacent the folding means **47** and the tacking means **55** to allow the pin strip to be tacked into the pleat of the drapery panel when the tacking means **55** fixedly fastens the pleat together after it has been folded by the folding means **47.** The construction and uses of pin strips are well known to those skilled in the art, see, for example, the Strube U.S. Pat. No. 2,115,593 patent.

The pleating apparatus **11** includes upper and lower support bars **91, 93** mounted in the housing **17.** Each of the plurality of pleat forming devices **15** includes upper and lower lugs **95, 97** or the like to slidably mount the pleat forming devices **15** onto the upper and lower support bars **91, 93** preferably through ball bearing assemblies **99.** Lazy tong means **101** join the plurality of pleat forming devices **15** together for allowing each of the plurality of pleat forming devices **15** to be uniformly extended or contracted relative to each other. Preferably, the lazy tong means **101** is coupled to a threaded drive rod **103.** The drive rod **103** causes the lazy tong means **101** to extend or contract and, thereby, causes the plurality of pleat forming devices **15** to be uniformly moved relative to each other. A cam member activating shaft **105** is coupled to each of the cam members **15** of the plurality of pleat forming devices **15** preferably through ball bearing spline assemblies well known to those skilled in the art (see, for example, brochure No. DSM-101, Saginaw Steering Gear Division, General Motors Corp).

The pleating apparatus **11** preferably includes overlap marker means **107** mounted on the frame **45** of

each outer pleat forming device **15** for establishing the distance from the inner edge of the drapery panel to the center of the first pleat thereof. It should be noted that the overlap portion of a drapery panel is that portion which falls in the center of a pair of drapery panels so that when a pair of drapery panels are closed, the overlap portions extend over each other to form the closure. Trade practice has established the overlap portion of a drapery panel at 3½ inches. To establish the distance from the inner edge of the drapery to the center of the first pleat it is necessary to add ½ of the pleat size measurement to the 3½ inch overlap. Each overlap marker means **107** includes a marker **109** and a cam means **111.** By being mounted on the frame **45** of each outer pleat forming device **15,** the overlap marker means **107** moves proportionally with the plurality of pleat forming devices **15.** The cam means **111** of the overlap marker means **107** is fixedly mounted to the cam follower member **61** of the adjustment means **57** of the adjacent pleat forming device **15.** As the adjustment means **57** varies the size of the pleats to be formed by moving the finger means **49** relative to the fork means **53,** the cam means **111** through a cam follower **113** pivotally mounted on the marker **109** varies the setting of the overlap marker means **107** in direct proportion thereto. For example, when the finger means **49** are raised to increase the size of the pleat, the marker **109** is moved to correlate with the larger size pleat. The pleating apparatus **11** preferably includes overlap marker means **107** on each end thereof to accomodate both right-hand and left-hand drapery panels, that is, drapery panels having the overlap portion on either the right or left side.

An add-on gauge means **115** is preferably included on the pleating apparatus **11** for allowing it to be used for the manufacture of drapery panels having more pleats than the pleating apparatus **11** has pleat forming devices **15.** It should be noted that since the plurality of pleat forming devices **15** are spaced center-to-center for a flat, unpleated drapery panel, it is necessary when spacing the flat, unpleated portion of a partially pleated drapery panel to center the first pleat to be formed in the flat, unpleated portion a distance from the center of the last folded pleat equal to one pleat and one space. The add-on gauge means **115** includes a frame **117** mounted on the lazy tong means **101** for allowing the add-on gauge means **115** to be uniformly extended or contracted relative to the plurality of pleat forming devices **15.** A scale **119** is mounted on the frame **117.** The scale **119** includes numerical indicia that correspond to various pleat sizes. The use the add-on gauge means **115,** the center fold of the last folded pleat is placed in line with the appropriate pleat size indicium on the scale **119** and the flat, unfolded portion is placed over the finger means **49** of adjoining pleat forming devices **15.** Thus, the amount of fabric that is taken up in the pleat fold is accounted for and the proper center-to-center pleat spacing measurement is maintained.

In the operation of the pleating apparatus **11,** the first step is to determine the width of the hemmed drapery panel to be pleated, the number of pleats desired in the finished drapery panel, and the desired finished width of the drapery panel. Next, the pointer **25** of the computing device **13** is set on the proper hemmed width indicium of the first column **21** of the proper scale **19** and the first window portion **39** of the cursor **31** is set on the proper finished width indicium of the fourth column **29.** The correct pleat size indicium and space size indicium are then visible through the third and second window portions **42, 41** respectively of the cursor **31.**

Next, the computed pleat size and space size are entered into a control system of a type well known to those skilled in the art at a control panel **212.** The control system regulates the pleat size by activating the cam member **59** by suitable well known means to raise or lower the finger means **49** relative to the fork means **53.** The control system regulates the space size by activating the lazy tong means **101** to extend or contract each pleat forming device **15** relative to the other pleat forming devices **15.**

Next, the inner edge of the drapery panel being pleated is aligned with one of the overlap marker means **107** and the upper section of the drapery panel is placed over the finger means **49** of the adjoining pleat forming devices **15** with the lower section of the drapery panel placed in the bin **17'** of the housing **17.** The clamp means **51** of the pleat forming devices **15** are then moved against the finger means **49** to clamp the drapery panel therebetween. The control system then activates the first electric solenoid **80** to cause the second slidable plate **75** and, thus, the fork means **53** to move downward first forcing the finger cam means **79** to spread the first and third finger members **65, 69** and then forcing the section of the drapery panel to be pleated around the finger means **49** to form pleats. The first electric solenoid then raises the second slidable plate **75** causing the first and third finger members **65, 69** to return to their original position flanking the second finger member **67** and holding the folded fabric therebetween. As the second slidable plate **75** continues its upward motion, the striker means **77** forces the first and second outside arm means **71, 73** in a downward arc which causes outside creases to be formed in the triple-fold pleat. As the second slidable plate **75** moves upward, the control system activates the second electric solenoid **85** to cause the stapler means **81** to tack the folded pleats together. The clamp means **51** is then released and the drapery panel is removed from the pleating apparatus **11.** The tacked pleats of the drapery panel are then sewn together in a manner well known to those skilled in the art thereby completing the pleating operation.

Although the invention has been described and illustrated with respect to a preferred embodiment thereof, it is not to be so limited since changes and modifications may be made therein which are within the full intended scope of the invention.

I claim:

1. An apparatus for use in the manufacture of the pleated upper section of a drapery panel, said apparatus comprising a pleat forming device for folding and tacking pleats in the upper section of the drapery panel, said pleat forming device including:

a. a frame;

b. folding means mounted on said frame, said folding means having finger means for supporting the section of the drapery panel to be pleated, clamp means for holding the section of the drapery panel to be pleated against said finger means, and fork means for forcing the section of the drapery panel to be pleated around said finger means to form a pleat; and

c. tacking means mounted on said frame for fixedly fastening pleats together after they have been folded by said folding means.

2. The apparatus of claim **1** in which said folding means includes adjustment means for moving said finger means relative to said fork means to allow the size of the pleats to be formed to be varied.

3. The apparatus of claim **1** in which said tacking means comprises:

a. stapler means for stapling pleats together after they have been folded;

b. stapler actuating means for operating said stapler means coactively with said folding means.

4. The apparatus of claim **1** in which is included a computing device for determining the required pleat size and space size from a given hemmed width size of a drapery panel and a given number of pleats desired in the finished drapery panel to obtain a given finished width of the drapery panel, said computing device comprising a plurality of scales, each of said scales corresponding to a specific number of pleats, each scale including:

a. a first column of numerical indicia corresponding to the hemmed width of various drapery panels;

b. a second column of numerical indicia corresponding to the pleat size of various drapery panels, said second column being movable relative to said first column;

c. a pointer fixedly mounted intermediate of said second column and movable therewith relative to said first column for alignment with a given numerical indicium of said first column;

d. a third column of numerical indicia corresponding to the space size of various drapery panels;

e. a fourth column of numerical indicia corresponding to the finished width of various drapery panels; and

f. a movable cursor for alignment with the desired finished width indicium of said fourth column to show the necessary space size indicium of said third column and the necessary pleat size indicium of said second column when said pointer is set on the given hemmed width indicium of said first column.

5. An apparatus for use in the manufacture of the pleated upper section of a drapery panel, said apparatus comprising a computing device for determining the required pleat size and space size from a given hemmed width size of a drapery panel and a given number of pleats desired in the finished drapery panel to obtain a given finished width of the drapery panel; and a plurality of pleat forming devices for evenly spacing, folding and tacking a plurality of pleats in the upper section of the drapery panel in accordance with the computations of said computing device without stretching the fabric of the drapery panel; each of said plurality of pleat forming devices including:

a. a frame;

b. folding means mounted on said frame, said folding means including finger means for supporting the section of the drapery panel to be pleated, clamp means for holding the section of the drapery panel to be pleated against said finger means, and fork means for forcing the section of the drapery panel to be pleated around said finger means to form a pleat; and

c. tacking means mounted on said frame for fixedly fastening pleats together after they have been folded by said folding means.

6. The apparatus of claim **5** in which said folding means includes adjustment means for moving said finger means relative to said fork means to allow the size of the pleats to be formed to be varied.

7. The apparatus of claim **6** in which said adjustment means comprises a cam member and a cam follower member, said cam follower member consisting of a first slidable plate onto which said finger means is mounted and onto which said clamp means is pivotally mounted above said finger means.

8. The apparatus of claim **7** in which is included overlap marker means for establishing the distance from the inner edge of the drapery panel to the center of the first pleat of the drapery panel; said overlap marker means including a marker and a cam means, said cam means being fixedly attached to said first slidable plate of said adjustment means of an adjacent pleat forming device for adjusting said marker in direct proportion to said finger means of the adjacent pleat forming device.

9. The apparatus of claim **7** in which said folding means includes first and second outside arm members; in which said finger means of said folding means includes first, second and third finger members; and in which said first and second outside arm members coact with said fork means to force the section of the drapery panel to be pleated around said first, second and third finger members to form a triple-fold pleat.

10. The apparatus of claim **9** in which is included a second slidable plate and in which is included striker means mounted on said second slidable plate, said fork means of said folding means being mounted on said second slidable plate and said first and second outside arm members being pivotally mounted on said frame and being activated by said striker means.

11. The apparatus of claim **10** in which said folding means includes a first electric solenoid for activating said second slidable plate to cause said fork means to force the section of the drapery panel to be pleated around said finger means to form a pleat.

12. The apparatus of claim **5** in which said tacking means comprises:

a. stapler means for stapling pleats together after they have been folded by said folding means; and

b. stapler actuating means for operating said stapler means coactively with said folding means.

13. The apparatus of claim **12** in which said stapler actuating means includes a second electric solenoid attached to said stapler means through a scissors-like member.

14. The apparatus of claim **5** in which each of said plurality of pleat forming devices includes a pin strip holding member mounted on said frame for holding a pin strip adajcent said folding means and said tacking means to allow the pin strip to be tacked into the pleat of the drapery panel when said tacking means fixedly fastens the pleat together after it has been folded by said folding means.

15. The apparatus of claim **5** in which is included lazy tong means for attaching said plurality of pleat forming devices together to allow each of said plurality of pleat forming devices to be uniformly extended or contracted relative to each other.

16. The apparatus of claim **5** in which said computing device comprises a plurality of scales, each of said

scales corresponding to a specific number of pleats, each scale including:

a. a first column of numerical indicia corresponding to the hemmed width of various drapery panels;

b. a second column of numerical indica corresponding to the pleat size of various drapery panels, said second column being movable relative to said first column;

c. a pointer fixedly mounted intermediate of said second column and movable therewith relative to said first column for alignment with a given numerical indicium of said first column;

d. a third column of numerical indicia corresponding to the space size of various drapery panels;

e. a fourth column of numerical indicia corresponding to the finished width of various drapery panels; and

f. a movable cursor for alignment with the desired finished width indicium of said fourth column to show the necessary space size indicium of said third column and the necessary pleat size indicium of said second column when said pointer is set on the given hemmed width indicium of said first column.

17. The apparatus of claim **15** in which is included add-on gauge means for allowing said apparatus to be used for the manufacture of pleated drapery panels having more pleats than said apparatus has pleat forming devices; said add-on gauge means including an add-on gauge frame mounted on said lazy tong means for allowing said add-on gauge means to be uniformly extended or contracted relative to said plurality of pleat forming devices and including a scale having numerical indicia that corresponds to various pleat sizes and being mounted on said add-on gauge frame for allowing the center fold of the last folded pleat in a partially folded drapery panel to be positioned adjacent the appropriate numerical indicium of said scale thus maintaining the proper center-to-center pleat spacing measurement.

18. An apparatus for use in the manufacture of the pleated upper section of a drapery panel, said apparatus comprising a computing device for determining the required pleat size and space size from a given hemmed width size of a drapery panel and a given number of pleats desired in the finished drapery panel to obtain a given finished width of the drapery panel, said computing device including at least one scale, said scale corresponding to a specific number of pleats and having:

a. a first column of numerical indicia corresponding to the hemmed width of various drapery panels;

b. a second column of numerical indica corresponding to the pleat size of various drapery panels, said second column being movable relative to said first column;

c. a pointer fixedly mounted intermediate of said second column and movable therewith relative to said first column for alignment with a given numerical indicium of said first column;

d. a third column of numerical indicia corresponding to the space size of various drapery panels;

e. a fourth column of numerical indicia corresponding to the finished width of various drapery panels; and

f. a movable cursor for alignment with the desired finished width indicium of said fourth column to show the necessary space size indicium of said third column and the necessary pleat size indicium of said second column when said pointer is set on the given hemmed width indicium of said first column.

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