March 26, 1963 K. R. LOFGREN 3,082,715

CLOTH FOLDING AND STITCHING DEVICE

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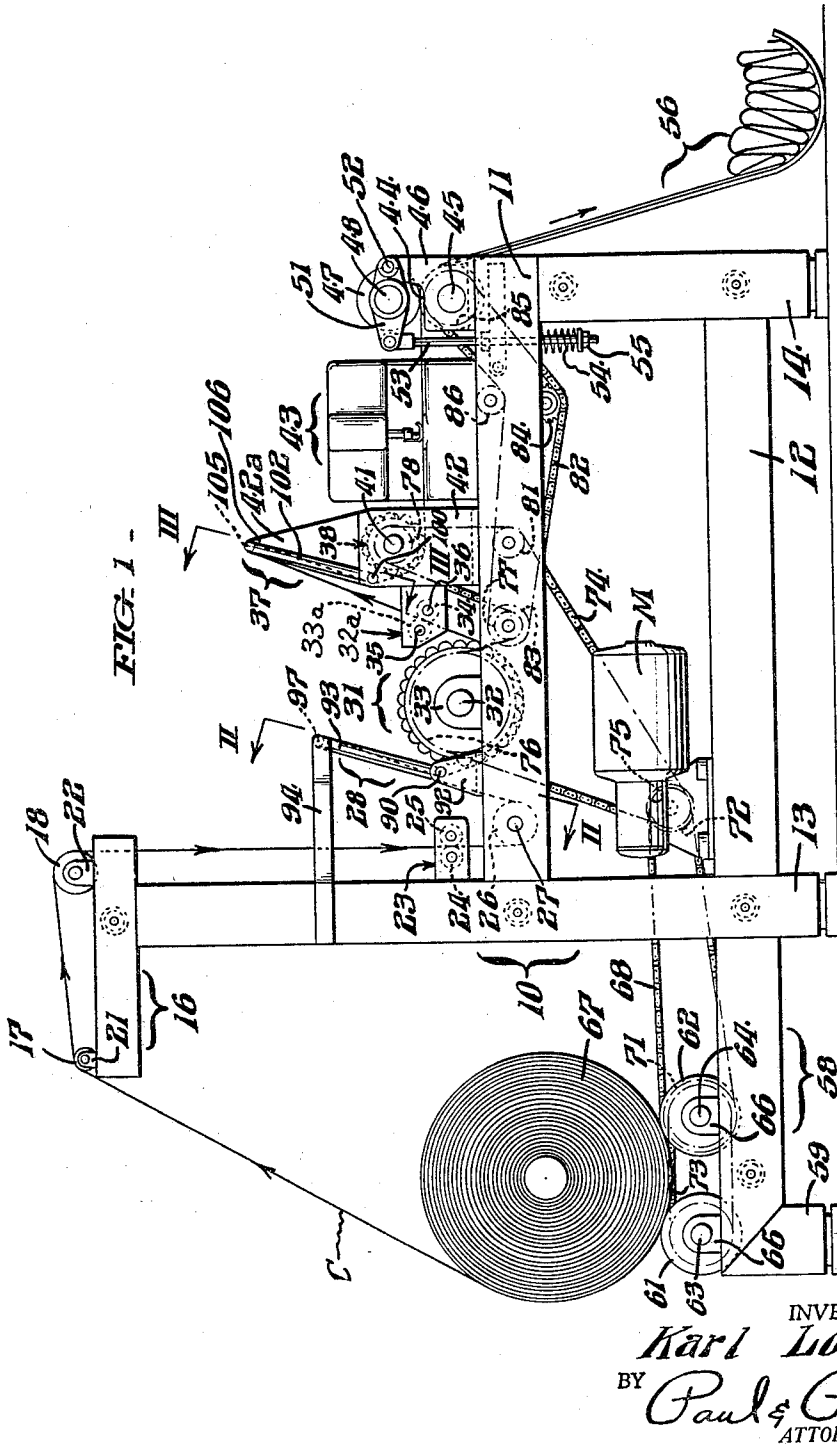


FIG. 1

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FIG. 2.

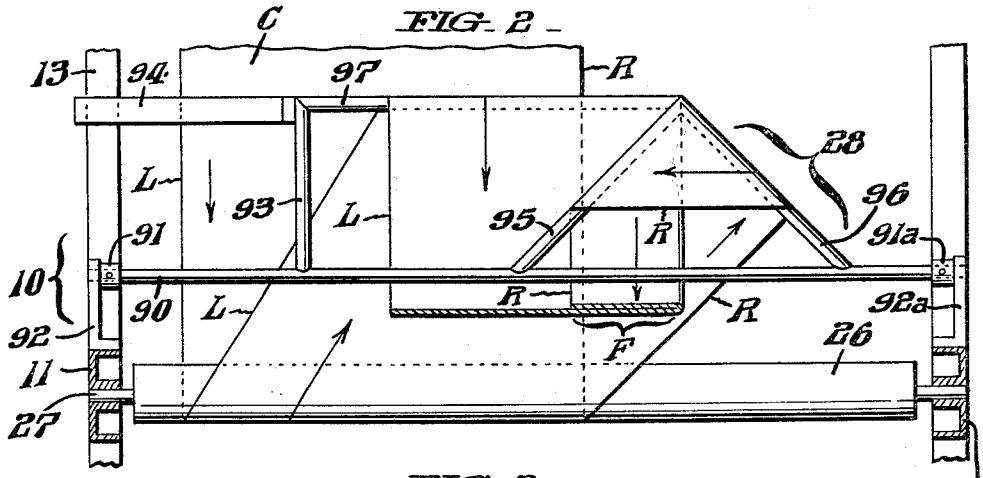



FIG. 3.

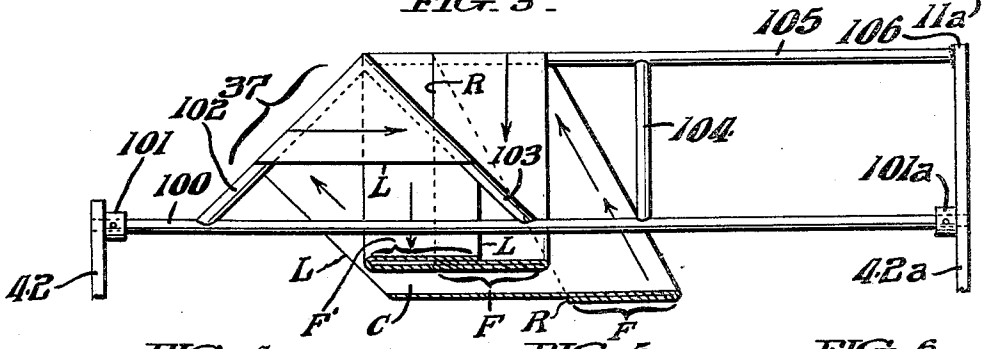



FIG. 4.

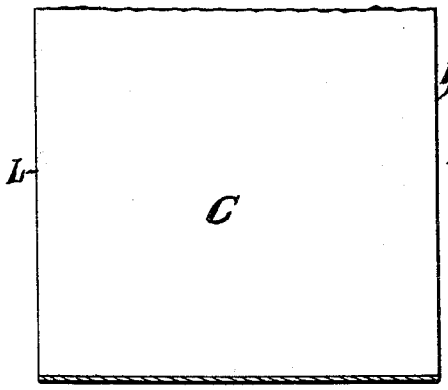



FIG. 5.

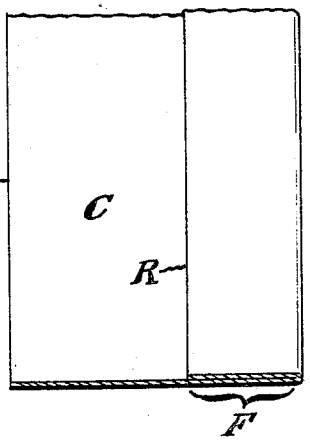
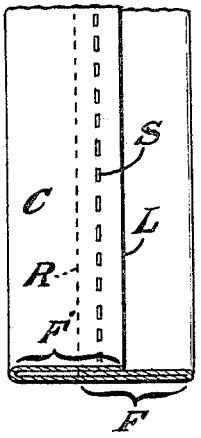



FIG. 6.




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United States Patent Office 3,082,715 Patented Mar. 26, 1963



3,082,715

# CLOTH FOLDING AND STITCHING DEVICE

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Filed Mar. 15, 1960, Ser. No. 15,171
2 Claims. (Cl. 112—2)

This invention relates to automatic folding devices. More particularly, this invention relates to machinery for the continuous and automatic folding or folding and stitching of continuously running fabric and the like.

In the past, the efficient and economical preparation of lengths of folded cloth suitable for use as surgical dressings, or the like, has presented considerable difficulties by reason of the lack of suitable automatic machinery adapted to such production. As a consequence, folded cloth for surgical dressings, draperies, hems on shade cloth and a variety of similar items has heretofore generally been produced by a hand operation entailing a variety of successive individual steps, such as the cutting of the cloth initially into the proper lengths, folding the cloth, and whenever necessary or desirable stitching the folded cloth in a manner to retain the fold. Needless to say, the aforementioned cumbersome hand method of production is necessarily time consuming, costly and generally inefficient, particularly when an attempt is made to gear such production to the production schedules of related items produced by modern machine methods.

Accordingly, it is an object of this invention to provide automatic cloth folding or folding and stitching apparatus whereby hand operation is entirely eliminated.

It is another object of this invention to provide automatic cloth folding or folding and stiching apparatus whereby a continuous length of folded and stitched cloth may be produced from a single and continuous roll of said cloth.

It is another object of this invention to provide a two-stage cloth folding apparatus wherein said cloth may be run through said apparatus substantially in a straight line without appreciably altering the sidewise direction thereof.

It is another object of this invention to provide a cloth folding or folding and stitching apparatus whereby a continuous length of folded and stitched cloth is produced from which individual lengths thereof may be produced as desired by a simple cutting operation.

Other objects and attendant advantages of this invention will become apparent hereinafter and in the drawings wherein:

FIG. 1 is a view in side elevation of a cloth folding and stitching apparatus as provided in accordance with this invention;

FIG. 2 is a sectional view of the apparatus taken as indicated by the lines and arrows II—II of FIG. 1;

FIG. 3 is a sectional view of the apparatus taken as indicated by the lines and arrows III—III of FIG. 1;

FIG. 4 is a view of the flat segment of the cloth as it appears before entry in the apparatus;

FIG. 5 is a view of the cloth segment after one stage of its progress through the apparatus as provided in accordance with this invention; and

FIG. 6 is a view of the cloth segment after it has passed through subsequent stages of the apparatus.

The following description is directed to the specific form of the apparatus as shown in the drawings and is not intended to be addressed to the scope of the invention as exemplified by the drawings.

Adverting herewith to the specific form of the invention illustrated in the drawings, a frame **10** comprising upper cross pieces **11** and **11***a*, lower cross piece **12** and uprights **13** and **14**, is provided for the support of the operating elements of the cloth folding and sewing device as provided in accordance with this invention.



As may be seen in FIG. 1, an inlet scaffolding **16** is bolted to the top of the upright **13** for the support of inlet guide rolls **17** and **18** journalled in the bearings **21** and **22**, respectively. Secured to the upright **13** intermediate the top and bottom thereof is a selvage guide **23** supporting guide rolls **24** and **25**. Another guide roll **26** having a shaft **27** journalled at the opposite ends thereof in the cross pieces **11** and **11***a* is positioned below the guide rolls **24** and **25** and serves as a guide for the cloth C entering a folding frame **28** in a manner to be explained more fully hereinafter.

Immediately forward of the folding frame **28** is a reel **31** having a shaft **32** journalled in a stand **33** affixed to the cross piece **11**. Forward of the reel **31** is a second selvage guide **32***a* which supports the guide rolls **33***a* and **34** having shafts **35** and **36** journalled therein. A second stage folding frame **37** is positioned immediately forward of the selvage guide **32***a* and adjacent a second reel **38** forward of said rack, the shaft **41** of which is journalled in the stand **42**. Mounted between the cross pieces **11** and **11***a*, forward of the reel **38**, is a sewing machine **43** provided for the stitching of cloth C in a manner to be explained more fully hereinafter.

At the extreme forward end of the frame **10** there is provided a lead-off roll **44** having a shaft **45** journalled in the stand **46** affixed to the cross piece **11** and a pressure roll **47** having a shaft **48** journalled in the plate **51**, which is pivoted to the stand **46** by the pin **52**. To the opposite end of the diamond-shaped plate **51** there is hinged a rod **53** to which there is mounted a spring **54** which may be compressed by turning the nut **55** at the distal end of the rod **53**. The compression force of the spring **54** normally urges the roll **47** toward the roll **44** thereby creating a pressure therebetween. Adjacent the forward end of the frame **10** there is positioned a scray or take-up **56** for the reception of folded and sewn cloth, as shown in FIG. 1.

Rearwardly of the frame **10**, there is provided an extension of the cross piece **12** to form a rolling-off stand **58** having a supporting leg **59**. Rollers **61** and **62** having shafts **63** and **64** supported in the stands **65** and **66**, affixed to the rolling-off stand **58**, are provided for the support of a cloth roll **67**. Roller **62** is driven in a counter-clockwise direction by a drive chain **68** which encircles a sprocket **71** affixed to the roller **62** and also encircles a sprocket **72** driven by a motor M mounted upon the cross piece **12**. A second chain **73** links the rollers **61** and **62**, whereby the roller **61** is also rotated in a counter-clockwise direction. A third chain **74** encircles another motor sprocket **75**, passes around a sprocket **76** affixed to the reel **31** then around the sprocket **77** journalled in the cross piece **11**, thence upward and around a sprocket wheel **78** affixed to the reel **38**, then downward and around another sprocket wheel **81** journalled in the cross piece **11**, and from there the drive chain **74** passes again about the motor sprocket **75**. Another chain **82** encircles a sprocket wheel **83** coaxially journalled with the sprocket **77** and passes also around another sprocket wheel **84**, then upward around a sprocket **85** affixed to the roll **44**, thence the chain **82** passes under another sprocket **86** journalled in the cross piece **11** and finally returns to the sprocket **83**.

As may be seen in FIG. 2, the first stage folding frame **28** comprises a smooth surfaced horizontal bar **90** secured at the opposite ends thereof in the receptacles **91** and **91***a* affixed, respectively, to the stands **92** and **92***a*, which are in turn mounted, respectively, on the cross pieces **11** and **11***a*. Extending at right angles to the horizontal bar **90**

is another smooth surfaced bar **93** which is supported in a generally vertical position by the support piece **94** extending horizontally from the upright **13**. From approximately the center of the horizontal bar **90** another bar **95** extends vertically in the same plane as the bar **93** to form an acute angle with the bar **90** on the side of the bar **95** opposite the bar **93**. Another bar **96**, similarly smooth surfaced extends from the top of the bar **95** to the bar **90**, thereby completing a generally vertical triangular structure having an angle of 90° at the vertex formed by the bars **95** and **96**. From the aforesaid vertex, there extends another horizontal bar **97** parallel to the bar **90** to join the top of the bar **93**, thereby forming a vertically extending trapezoidal structure defined by the bars **95**, **97**, **93** and a central part of the bar **90**.

As may be seen in FIG. 3, the second stage folding rack **37** comprises a horizontally extending bar **100** having the opposite ends thereof supported in receptacles **101** and **101***a* affixed, respectively, to the stands **42** and **42***a*. Smooth surfaced bars **102** and **103** rise generally vertically from the horizontal bar **100** and meet at right angles at the tops thereof to form a triangular structure at the left side of the horizontal bar **100** as seen in FIG. 3. Another bar **104** rises vertically in the same plane as the bars **102** and **103** forming a right angle with the bar **100**. Another horizontal bar **105** parallel to the bar **100** joins the apex of the triangular structure formed by bars **102** and **103** with the top of the bar **104** and extends to the top **106** of the vertical stand **42***a* on the right side of the frame **10** as viewed in FIG. 3.

FIGS. 4, 5 and 6 illustrate progressive stages of the cloth C as it passes through the folding and sewing device as provided in accordance with this invention. FIG. 4 shows cloth C as it appears when unrolled from the roll **67**, FIG. 5 illustrates the folded condition of the cloth after passing through the first stage folding rack **28**, and FIG. 6 illustrates the folded and sewn condition of the cloth C after passing the second stage folding rack **37** and the sewing machine **43**, all in a manner to be explained more fully hereinafter.

*Operation*

In accordance with this invention, cloth C is first unrolled from the bolt or roll **67** and threaded through the machine by passing it over the inlet guide rolls **17** and **18** positioned on the inlet scaffolding **16**, thence it is brought downward past the selvage guide **23** and between the guide rolls **24** and **25**. The selvage guide **23** controls the exact run of the edges of the cloth C. From there the cloth C is passed around the roll **26** and upward into the first stage folding frame **28**. Within the frame **28** the cloth C is brought upward at a diagonal so that a portion of the left-hand side thereof passes over the bar **97** and hangs downward on the forward side of said bar so that the side L of the cloth C hangs parallel to the bar **93**. A small portion of the cloth C at the right-hand side thereof is passed first around the bar **96** and then around the bar **95** so that the right side R of the cloth C is parallel to the bar **95** as it passes from the roll **26** to the bar **96** then parallel to the bar **90** as it passes from the bar **96** to the bar **95** and finally parallel to the bar **93** as it passes around the bar **95** and moves downward to round the reel **31**. In the process of passing through the frame **28** a first fold F is formed in the cloth C. From the reel **31** the cloth C passes through the selvage guide **32** and between the guide rolls **33** and **34** and thence to the second stage folding frame **37**. The cloth is then passed upward and the right-hand side thereof is passed over the horizontal bar **105** so that the right-hand edge which is now the closed edge of the fold F passes downward parallel to bar **104**. The left-hand portion of the cloth C is passed around the bar **102** and then around the bar **103** so that the right edge R of the cloth hangs in its final stage through the frame prependicularly to the bar **104**. As the cloth C passes through



the rack **37**, the left edge L thereof is first parallel to the bar **103**, then after passing around the bar **102** the edge L is parallel to the bar **100** and finally after passing the bar **103** the edge L becomes parallel to the bar **104** and to the edge R. In the course of the passage of the cloth C through the frame **37**, a second fold F′ is created therein. From the foregoing description, it will have become evident that the cloth C passes through each folding frame in such a manner that the warp ends over the entire width of the fabric must travel an equal distance regardless of how far from the selvage the fold is made. It will be evident, also, that the cloth C after passing through the frames **28** and **37** is doubly folded so that the left edge L thereof overlaps the right edge R. After leaving the second stage folding frame **37**, the cloth passes around the reel **38** and through the sewing machine **43** thence it passes between the rolls **47** and **44** to be finally deposited in the scray **56**.

chanical and automatic folding and sewing operation may be accomplished after threading the cloth through the device in the manner aforedescribed by switching on the motor M which directly drives the sprocket wheels **72** and **75** and consequently the drive chains **68** and **74** causing the counter-clockwise rotation of the roller **62** and also the roller **61** linked therewith by the chain **73**. It will be apparent that the rotation of the rollers **61** and **62** is communicated to the roll **67** by frictional contact of the rollers **61** and **62** therewith, resulting in the clockwise rotation of the aforesaid roll **67**. The drive chain **74** directly drives the reels **31** and **38** as well as the sprocket wheel **77** which communicates its rotation through the shaft thereof to the coaxially journalled sprocket **83**. The drive chain **82** communicates the rotation of the sprocket **83** to the roll **44** which in turn causes the rotation of the roll **47** by frictional contact.

It will be clear from the foregoing that the cloth C in its progress through the folding and sewing device is continuously pulled forward by the reels **31**, **38** and the pressure rolls **47** and **44**.

As the cloth C passes through the machine it is automatically folded on the right-hand side thereof as it passes through the first stage folding frame **28** and again automatically folded at the left-hand side thereof as it passes through the second stage folding frame **37**. After being doubly folded in the manner described, so that the left edge thereof overlaps the right edge, the cloth passes through the sewing machine **43** so that the needle is aligned midway between the edges R and L and produces a continuous stitch line S thereat, thereby permanently securing the edges together and preserving the folds F and F′ as formed. After the cloth has been stitched it is pulled from the sewing machine through the pressure rolls **44** and **47** and allowed to accumulate in the scray **56** from which it can be removed for cutting in the lengths desired either by hand or by automatic machine.

Although this invention has been described with reference to a specific embodiment incorporating stitching means for the cloth as folded in accordance with the apparatus hereinbefore described, it will be clear that the folding apparatus may suitably be used alone without such stitching means as the occasion or need may arise.

It will be readily apparent that it is an important advantage of this invention that the apparatus provided in accordance therewith affords a means of producing from a continuous roll of cloth, a folded and stitched length of said cloth entirely without resort to any hand operation.

It will be also evident that a further advantage resides in the facility with which lengths of folded and stitched cloth may be produced as desired by a simple subsequent cutting operation.

Still another important advantage of this invention lies in the manner in which a two-stage folding apparatus is provided which permits the fabric to run in a generally straight line therethrough without appreciably altering the direction thereof.

Although this invention has been disclosed with reference to specific forms and embodiments thereof, it will be evident that a great number of variations may be made without departing from the spirit and the scope of this invention. For example, parts may be reversed, equivalent elements may be substituted for those specifically disclosed and certain features of the invention may be used independently of other features, all without departing from the spirit and scope of this invention as defined in the appended claims.

Having thus described my invention, I claim:

1. Apparatus for folding continuously running cloth comprising a metal framework, means for continuously feeding said cloth into said apparatus from a roll supported by said framework, selvage guide means for directing the travel of said cloth, a folding frame displaced laterally from the normal path of travel of said cloth and arranged to receive said cloth slantwise from said guide means, said frame comprising a plurality of smooth cylindrical bars forming a generally trapezoidal structure encompassing a smaller triangular structure at one end thereof, said cloth being directed to pass around one angle and one rectilinear side of said trapezoidal structure, whereby the opposite edges of said cloth are directed to travel perpendicularly to each other, a portion of said cloth being subsequently directed around the inner leg of said triangular structure, whereby the edge thereof travels parallel to the opposite edge of said cloth, said cloth being directed by said frame through a total path such that the locus of points perpendicular to the selvage thereof travel an equal distance therethrough, a second selvage guide arranged to receive said cloth from said folding frame and to direct the travel of said cloth, a second folding frame displaced laterally from the normal path of travel of said cloth arranged to receive said cloth slantwise from said second selvage guide means, said second frame comprising a plurality of smooth cylindrical bars forming a generally trapezoidal structure encompassing a smaller triangular structure at one end thereof, said cloth being directed to pass around one angle and one rectilinear side of said trapezoidal structure and subsequently around the inner leg of said trapezoidal structure, said frame being arranged to turn an edge of said cloth and form a fold in the edge thereof opposite to that in which a fold was formed by said first folding frame by directing said cloth through a pass such that the locus of points perpendicular to the selvage thereof travel an equal distance through said frame, and means disposed adjacent said second folding frame for guiding said folded cloth out of said apparatus.



2. In an apparatus for folding and stitching continuously running cloth having a rolling off stand at one end thereof and a stitching machine at the opposite end thereof, the improved cloth folding apparatus which comprises a selvage guide and guide roll pair arranged for directing the path of travel of said cloth, a folding frame positioned forward of said guide rolls and displaced laterally from the normal path of travel of said cloth, said frame being arranged for the slantwise reception of cloth thereinto, said frame comprising a plurality of cylindrical bars forming a generally trapezoidal structure encompassing a smaller triangular structure at one end thereof, said frame being geometrically arranged to direct one edge of said cloth to travel successively perpendicular to and then parallel to the opposite edge thereof to turn the edge of said cloth and form a fold therein while directing said cloth through path such that the locus of points perpendicular to the selvage thereof travel an equal distance to said frame, a reel forward of said frame arranged to advance said cloth through said apparatus, a second selvage guide and guide roll pair positioned forward of said reel and arranged to direct the path of travel of said cloth, a second folding frame displaced laterally from the normal path of travel of said cloth and arranged to receive said material slantwise from said second mentioned guide roll pair, said second mentioned frame being comprised of a plurality of cylindrical bars forming a generally trapezoidal structure encompassing a smaller triangular structure at one end thereof, said frame being arranged to direct one edge of said cloth to travel successively perpendicularly to and then parallel to the opposite edge thereof whereby said second mentioned folding frame turns the opposite edge of said cloth and forms a second fold therein while directing said cloth through a path such that the locus of points perpendicular to the selvage thereof travel an equal distance to said frame, a second reel positioned forward of said second mentioned folding frame arranged to advance said cloth through said apparatus and to pass said cloth to the stitching apparatus thereof.

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