

March 30 , 1926.

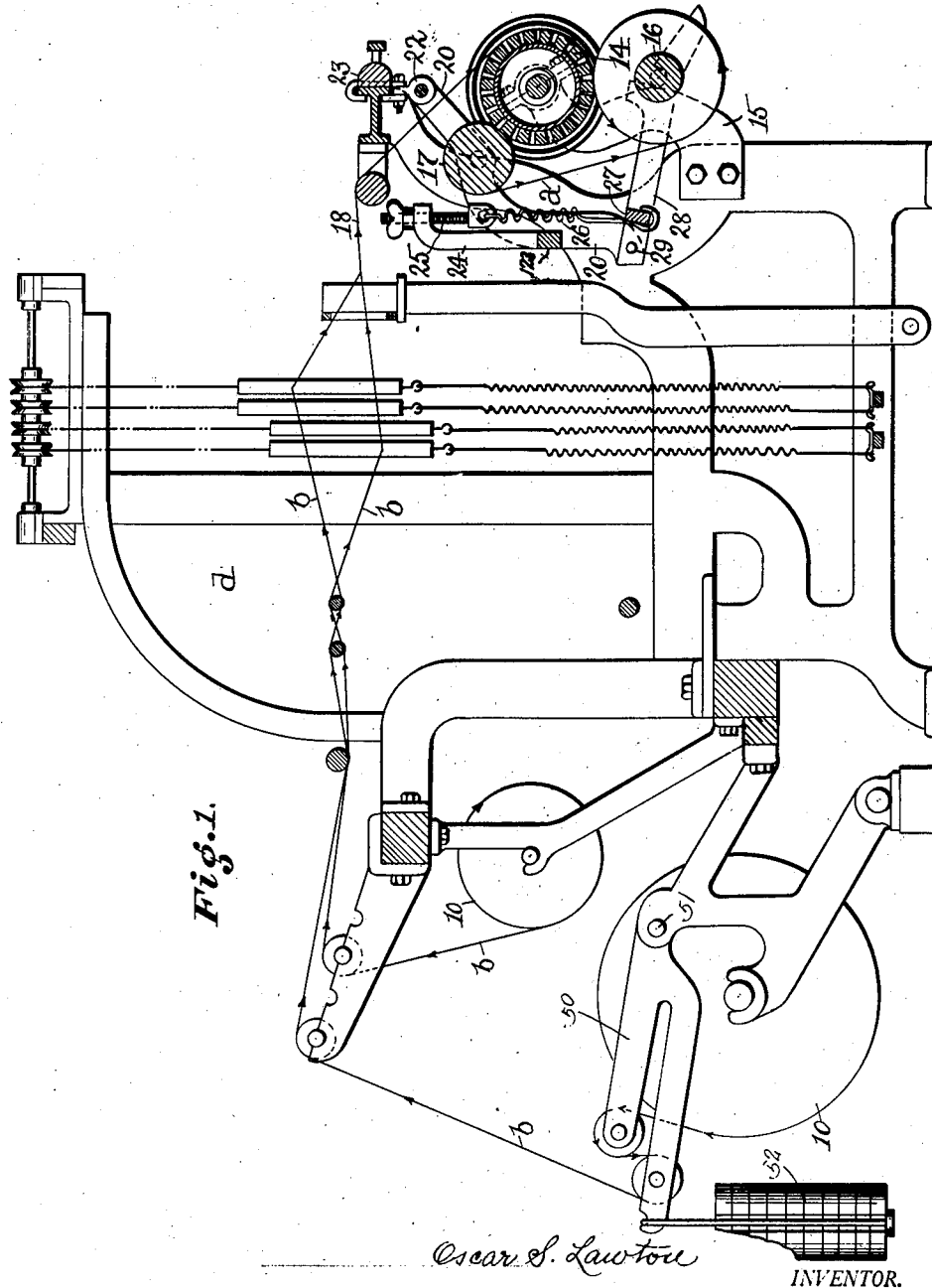
O. S. LAWTON

1,578,447

METHOD OF AND APPARATUS FOR PRODUCING CURVILINEAR FABRICS

Filed Sept.-17, 1921

4 Sheets-Sheet 1



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METHOD OF AND APPARATUS FOR PRODUCING CURVILINEAR FABRICS

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4 Sheets-Sheet 2

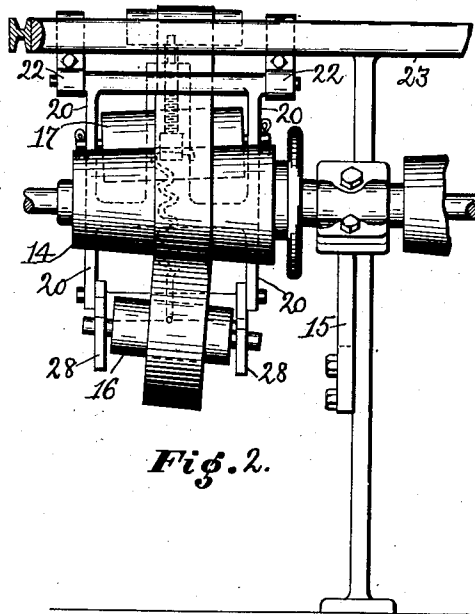


Fig. 2.

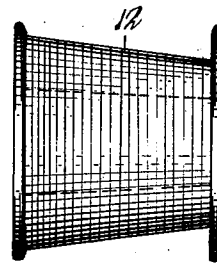


Fig. 3.

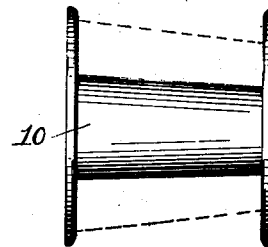


Fig. 4.

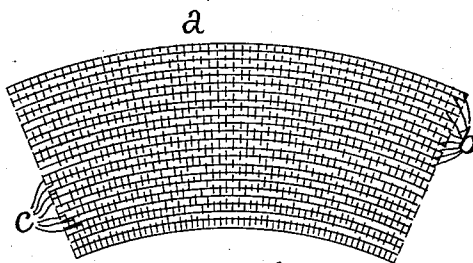


Fig. 6.



Fig. 5.

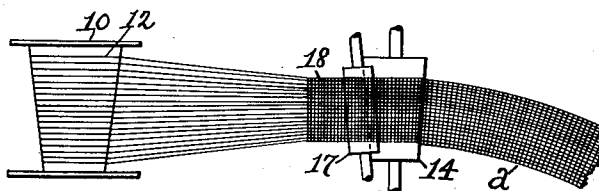


Fig. 7.

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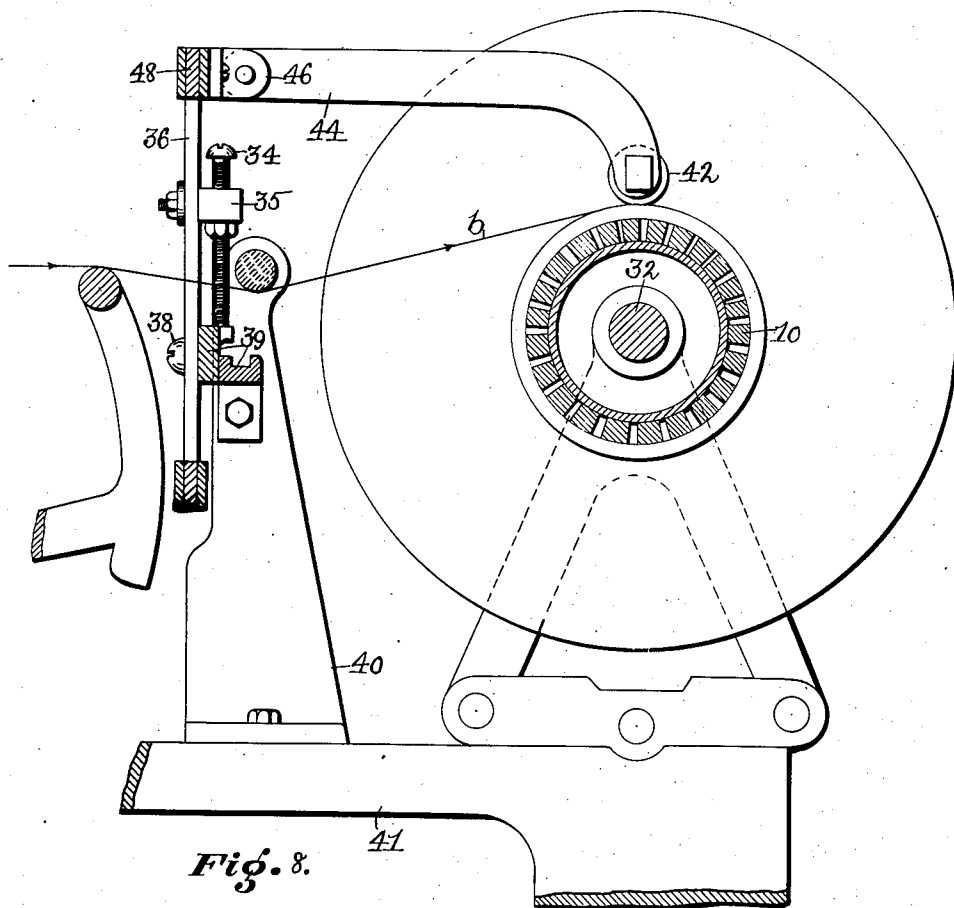
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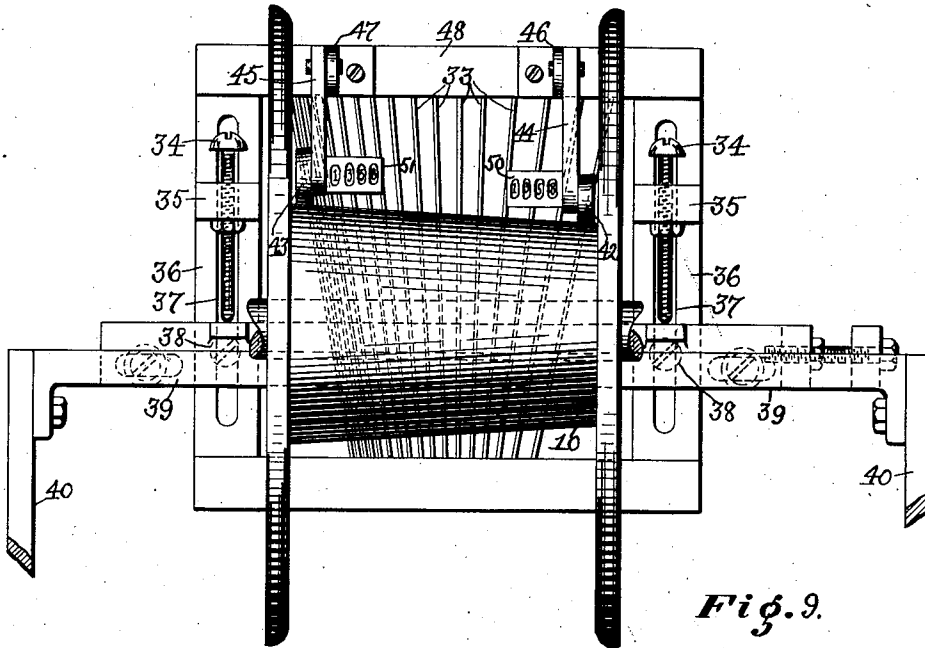


Fig. 9.

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1,578,447

UNITED STATES PATENT OFFICE.

OSCAR S. LAWTON, OF NEW BEDFORD, MASSACHUSETTS, ASSIGNOR OF ONE-THIRD TO ARTHUR L. O'LEARY, OF FAIRHAVEN, MASSACHUSETTS, AND ONE-THIRD TO HAROLD W. O'LEARY, OF NEWTON, MASSACHUSETTS.

METHOD OF AND APPARATUS FOR PRODUCING CURVILINEAR FABRICS.

Application filed September 17, 1921. Serial No. 501,435.

To all whom it may concern:

Be it known that I, OSCAR S. LAWTON, a citizen of the United States, residing in New Bedford, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Methods of and Apparatus for Producing Curvilinear Fabrics, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to a novel method of and apparatus for producing curvilinear fabric of superior quality and having a smooth and uniform texture.

The curvilinear fabric is produced with a loom having a tapering take-up roll, by arranging the warp threads before they are fed into the loom, in a predetermined relation to one another so as to establish between the number of warp threads on opposite sides of their center a ratio corresponding to the ratio between the diameters of the take-up roll on opposite sides of its center, and maintaining said warp threads in said established arrangement and under the same tension while passing through the loom.

The method of producing the improved curvilinear fabric may be practiced in a number of ways, and in the present instance I have illustrated a simple, highly efficient and comparatively inexpensive apparatus, as will be described, with which the improved fabric may be produced at a minimum cost.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Fig. 1 is a longitudinal section of a sufficient portion of an apparatus with which to produce the improved fabric, to enable the invention to be understood.

Fig. 2, an end view of the apparatus shown in Fig. 1 looking toward the left.

Figs. 3 and 4, details of the tapering warp beam.

Fig. 5, a diagrammatic view showing the concentric arrangement of the warp threads in the improved fabric.

Fig. 6 is a like view of the improved fabric.

Fig. 7, a diagrammatic view to illustrate the unequal lengths of warp threads,

the apparently straight fabric and the curvilinear fabric.

Fig. 8, a sectional view of a warping apparatus upon which the tapering warp shown in Figs. 1 and 3 may be produced, and

Fig. 9, an end view of the apparatus shown in Fig. 8 looking toward the left.

Referring to the drawing and particularly Figs. 5, 6 and 7, *a* represents the improved curvilinear fabric composed of warp threads, represented in Figs. 5 and 6 by the continuous curved lines *b* and a filler represented in Fig. 6 by the broken lines *c*. The warp threads *b* in the improved fabric are under the same tension and are concentrically arranged, as clearly represented in Figs. 5 and 6, which results in a superior curvilinear fabric in that the fabric is of uniform and greater strength throughout its length and width and possesses a smooth surface free from irregularities, and is capable of being produced at a minimum cost.

The improved curvilinear fabric *a* may be produced on a loom of ordinary or standard construction, by feeding into and out of the loom unequal lengths of warp threads *b* in predetermined definite arrangement and subjecting all of the warp threads to the same tension and maintaining them under the same tension while passing through the loom.

In Fig. 1 is shown a loom *d* upon which the improved curvilinear fabric *a* may be produced. The loom *d* is in the main of ordinary or known construction, except as will now be pointed out. The loom is provided at its rear end with tapered spools or rolls 10, see Fig. 4, upon which the warp threads *b* are wound in predetermined definite unequal lengths to form tapered beams 12 of warp threads, see Fig. 3, in which said threads vary in length uniformly from the end of largest diameter to the end of smallest diameter. The tapered beams 12 of warp threads will be hereinafter designated tapered warps.

The loom *d* is further provided at its front end with a tapering take-up roll 14, which has the same or substantially the same ratio of diameters at opposite sides of its center as the ratio of the extreme diameters of the warp beams 10, and is arranged

parallel with the tapered warp beams; that is, with its taper running in the same direction as the taper of the warp beams 10. The tapered take-up roll 14 is journaled in brackets or arms 15 attached to the framework of the loom and only one of which is herein shown, and said take-up roll has cooperating with it a cylindrical receiving roll 16 upon which the curvilinear fabric α , is wound, and a cylindrical presser roll 17, which is interposed between the take-up roll 14 and the receiving roll 16. The loom d forms a fabric 18 apparently straight while under tension (see Fig. 7), which passes around the tapered take-up roll 14, over the presser 17 and under and about the receiving roll 16 as indicated in Figs. 1 and 2, and after passing by the tapered take-up roll 14, said apparently straight fabric assumes the true or desired shape of the curvilinear fabric α . The presser roll 17 is mounted in levers or arms 20 pivotally mounted in hangers 22 attached to a stationary portion 23 of the framework of the loom. The levers 20 are connected by a cross bar 123 having an upright arm 24, which carries an adjusting screw 25, connected by a spring 26 with a cross bar 27 connecting levers 28 pivoted at 29 to the levers 20. The levers 28 support the receiving roll 16, which is held up in contact with the take-up roll 14 so as to be driven thereby, by the spring 26, whose tension or pressure can be regulated or determined by adjusting the screw 25 by means of the nut 30 thereon.

The presser roll 17 is arranged with its axis parallel with the tapered surface of the take-up roll 14, (see Fig. 2), so as to place the woven fabric α in contact with the take-up roll throughout the width of the said fabric.

The receiving roll 16 upon which the woven fabric α is wound, is arranged with its axis parallel to the tapered surface of the take-up roll, and as said receiving roll is located below the axis of said take-up roll, its axis is inclined in the opposite direction to that in which the axis of the presser roll is inclined, as shown in Fig. 2.

In weaving a plain curvilinear fabric, the warp threads on the side of the fabric which is of a curvature of smaller radius are drawn off slower than those warp threads on the side of the fabric which is of a curvature of greater radius, and this is effected in the present instance by the tapered take-up roll 14. By feeding the warp threads into the loom so that they are of definitely unequal lengths corresponding to the taper of the take-up roll, and by maintaining said definite arrangement of unequal lengths by subjecting all of the warp threads to the same tension, a superior curvilinear fabric is produced in which all of the warp threads

thereof are concentrically arranged, which results not only in a curvilinear fabric of superior quality which is of increased strength and durability, and is smooth and uniform in texture, but also one which can be produced at a minimum cost. The feeding of the warp threads of definite unequal lengths corresponding to the taper of the take-up roll, is provided for in the present instance by supplying the warp threads from the tapered warps 12, each of which is formed by winding the warp threads on the tapered roll 10, whose ratio of diameters corresponds to that of the take-up roll. The winding of the warp threads upon the tapered roll 10 may be effected with the apparatus shown in Figs. 8 and 9, wherein the tapered roll 10 is mounted on a shaft 32 which is rotated in any suitable manner and has cooperating with it a fan reed 33, which is constructed and arranged so that the volume of threads on one side in relation to the volume of threads on the other side of said reed will correspond in ratio to the two sides of the tapered warp roll 10 and therefore to the two sides of the tapered take-up roll 14.

In the present instance, the fan reed 33 is secured to a frame capable of being tilted with relation to the tapered roll 10, by means of the adjusting screws 34 extended through lugs 35 on the sides 36 of the said frame, which sides are provided with slots 37, through which are extended screws 38 which fasten the frame of the reed 33 in its adjusted position to a stationary support, shown as a cross bar 39, connecting uprights 40 attached to a suitable framework 41. The tapering roll 10 has cooperating with it rollers 42, 43, loosely mounted on levers 44, 45, pivoted to lugs or ears 46, 47 attached to the top cross bar 48 of the reed frame and bearing upon the opposite ends of the tapered roll 10.

The rollers 42, 43 are of different diameters, and the ratio between the diameters of the two rollers is the same as the ratio between the two ends of the warp roll or drum 10. The rolls 42, 43 are operatively connected with counter mechanisms 50, 51, which serve to indicate the number of revolutions made by the rollers while the tapered warp 12 is being wound upon the drum or roller 10.

Variations in the counting mechanisms serve to notify the operator, that the ratio between the two sides of the tapered warp is not being maintained, which enables him to rectify the same by tilting the fan reed by means of the adjusting screw 34 as above described.

By means of the tiltable reed cooperating with the tapering roll 10, all the warp threads which enter into the construction of the curvilinear fabric α are placed on the

roll 10 in a definite relation to each other so that a definite ratio between the number of threads on the opposite ends or sides of the tapering roll is established at the reed
 5 to correspond with the ratio between the diameters of the take up roll on opposite sides of its center, whereby the tapered warp 12 formed in the tapering roll 10 can be placed on the loom, so that the warp threads
 10 can be fed into and out of the loom in the same definite relation, by the take-up roll.

In the present instance and as shown in Fig. 1, two tapered warp beams marked 10 are shown, each having thereon, a tapered
 15 warp 12. The upper warp beam is represented as supported by a stationary portion of the framework and has thereon the tapered warp which may be designated the binder warp.

20 The lower warp beam 10 is also supported in a stationary portion of the framework and its tapered warp constitutes the body warp of the fabric, and this warp is passed about rollers mounted in the arms of a lever
 25 50 pivoted at 51 to the stationary framework, and the lever 50 has suspended from it a weight or weights 52 which imparts to the body warp the tension desired.

In the case of the upper or binder warp,
 30 the desired tension may be obtained as herein shown by the weight of the warp beam itself.

It will thus be seen that the warp threads are placed under the desired tension, and
 35 this desired tension for each warp is uniform and is maintained uniform while the warps are being fed into and out of the loom by the relation above set forth between the tapered warps and the tapered take-up roll.

40 By reason of the fact that all of the warp threads in the improved fabric are of uniform tension, they are of uniform diameter, and as a result the cloth produced is of uniform thickness and texture throughout.

45 It may be preferred to employ the apparatus herein shown for producing the improved curvilinear fabric by the method herein described, but it is not desired to limit the invention in this respect.

50 The warp herein described and the apparatus and method for making the same are not herein claimed, as they form the subject-matter of another application Serial No. 652,092 filed by me July 17, 1923.

55 Claims:

1. The method of making a curvilinear fabric with a loom having a tapered take-up roll, which consists in arranging the warp threads before they are fed into the loom
 60 in a predetermined relation to one another to form a tapered warp of material thickness and so as to establish between the number of warp threads on opposite sides of the center of said tapered warp a ratio corresponding to the ratio between the diam-
 65

eters of the take-up roll on opposite sides of its center, and maintaining said warp threads in said established arrangement and under the same tension while passing
 70 through the loom.

2. The method of making a curvilinear fabric with a loom having a tapered take-up roll, which consists in winding upon a warp beam a tapered warp of material
 75 thickness whose threads on opposite sides of the center of said warp beam have a ratio to each other which corresponds to the ratio between the diameters of the take-up roll on opposite sides of its center, feeding the warp threads from said warp beam
 80 into and through the loom and maintaining said warp threads in the same definite arrangement and under the same tension by said take-up roll.

3. The combination with a loom, of a 85 tapered take-up roll located at one end of the loom, and a warp beam located at the opposite end of the loom and having thereon a tapered warp of material thickness composed of threads wound thereon so as to have
 90 a definite ratio between the number of threads on the opposite ends or sides of the tapering warp corresponding with the ratio between the diameters of the take-up roll on opposite sides of its center.

4. The combination with a loom, of a tapered warp beam located at one end of the loom and a tapered take-up roll located at the opposite end of the loom and having
 100 substantially the same ratio of diameters at opposite sides of its center as the ratio of the extreme diameters of the tapered warp beam, the latter having thereon warp threads whose numbers on opposite sides or ends
 105 of the tapered warp beam form a tapered warp of material thickness and have a definite ratio which corresponds with the ratio between the diameters of the take-up roll on opposite sides of its center.

5. The combination with a loom of a 110 tapered beam of warp threads having thereon a tapered warp of material thickness whose volume of threads varies progressively from the small to the large end thereof and in substantially the same ratio as the
 115 diameters of the tapered beam vary from the small to the large end thereof and from which warp threads of definite unequal lengths are supplied to the loom, a tapered take-up roll conforming in taper to the
 120 tapered beam of warp threads and about which the woven fabric produced in the loom is passed to impart the curvature desired and means for subjecting the warp threads to the same tension, while passing
 125 through the loom.

In testimony whereof, I have signed my name to this specification.

OSCAR S. LAWTON.