Oct. 25, 1955 T. L. McCLIMANS 2,721,585

SPIRAL EDGE LACER

Filed Oct. 25, 1952 3 Sheets-Sheet 1

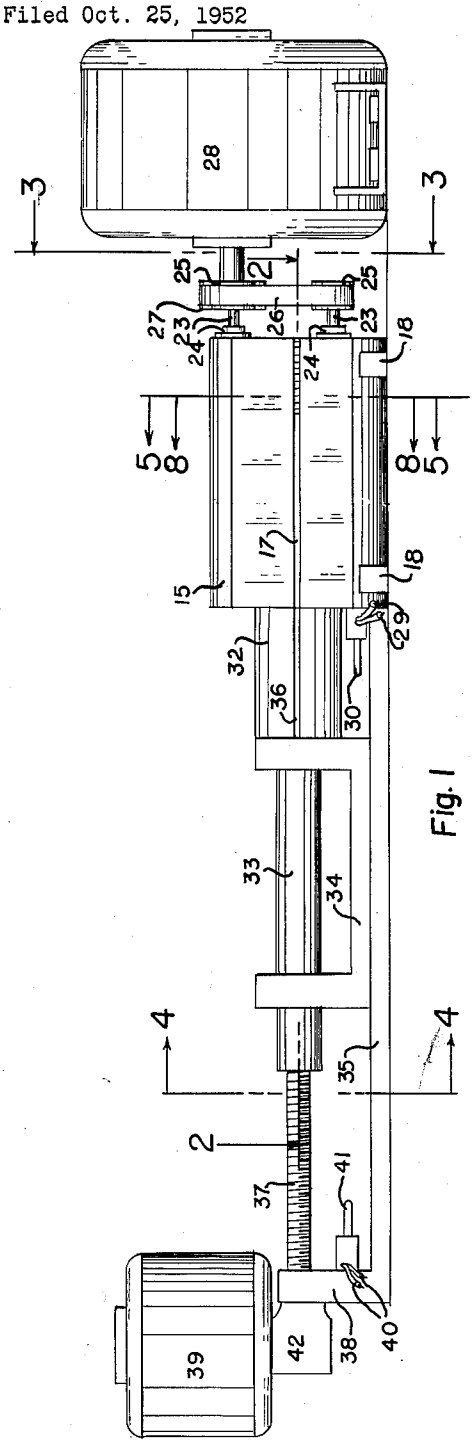


Fig. 1

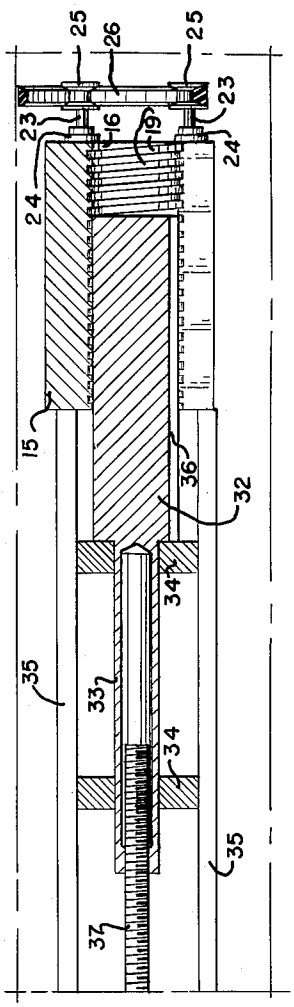


Fig. 2

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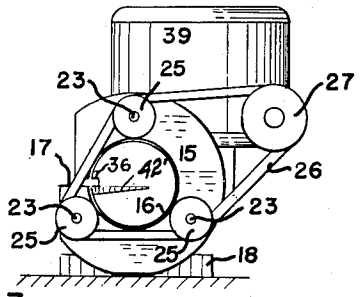


Fig. 3

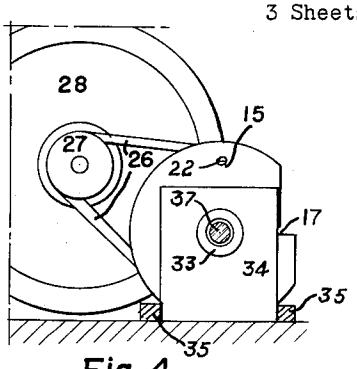


Fig. 4

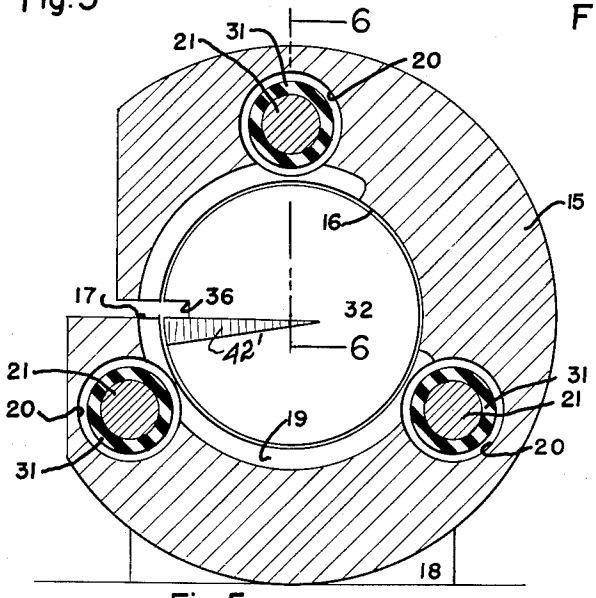


Fig. 5

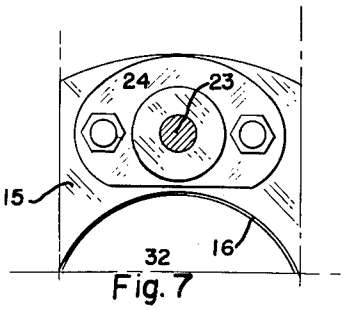


Fig. 7

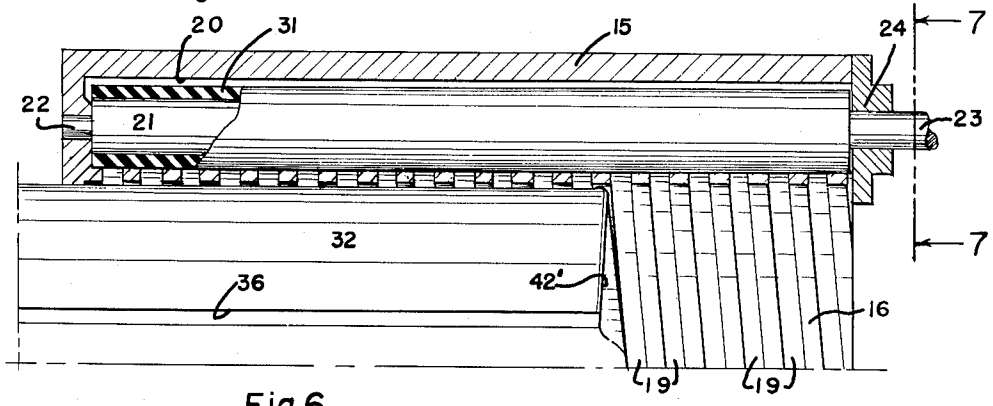


Fig. 6

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SPIRAL EDGE LACER

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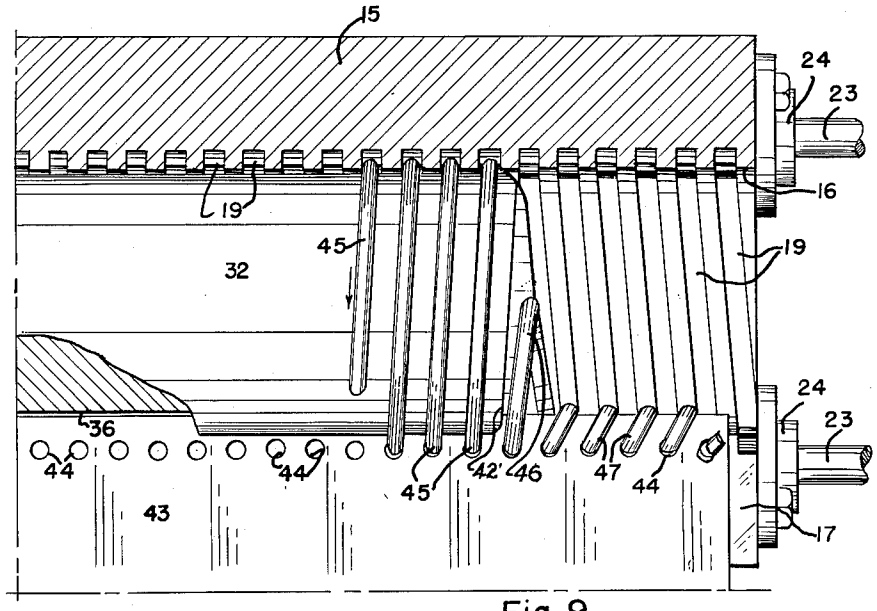


Fig. 9

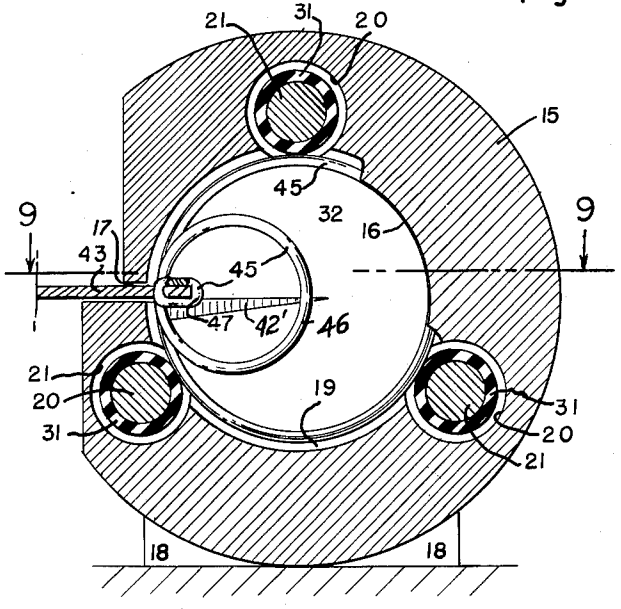


Fig. 8

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United States Patent Office 2,721,585 Patented Oct. 25, 1955

2,721,585

SPIRAL EDGE LACER

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Application October 25, 1952, Serial No. 316,927

6 Claims. (Cl. 140—92.7)

This invention relates to the art and practice of binding and finishing edges of single layer or multilaminate flat members by means of a continuous flexible strip, wire, or thong laced spirally about and along the edge to be so finished through uniformly-spaced holes intersecting the member in alignment inwardly adjacent such edge, and has as an object to provide novel and improved means operable to mechanically accomplish such spiral edge lacing.

A further object of the invention is to provide a mechanical spiral edge lacer operable to apply continuous flexible strips of various sizes and specific materials as spiral bindings on and along selected edges of diverse flat members.

A further object of the invention is to provide a mechanical spiral edge lacer conveniently susceptible of development in a variety of sizes, capacities, and spacings of successively-adjacent lacing convolutions.

A further object of the invention is to provide a mechanical spiral edge lacer that is practical, efficient, and rapid in the realization of its functions.

A further object of the invention is to provide a mechanical spiral edge lacer characterized by controls manipulable to regulate and determine the tightness or tension of the successiely-applied lacing convolutions.

A further object of the invention is to provide a mechanical spiral edge lacer that is relatively simple and inexpensive of manufacture, installation, and operation, free from onerous servicing and maintenance requirements, and eliminative of tedious and inefficient hand operations hitherto utilized.

With the foregoing and other objects in view, my invention consists in the construction, arrangement, and combination of elements as hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawings, in which—

Figure 1 is a front elevation of apparatus typically exemplifying the principles of the invention as arranged ready for practical use.

Figure 2 is a section longitudinally of the organization according to Figure 1 taken substantially on the indicated line 2—2 of the latter view.

Figure 3 is a cross section taken substantially on the indicated line 3—3 of Figure 1.

Figure 4 is a cross section taken substantially on the indicated line 4—4 of Figure 1.

Figure 5 is a cross section, on a relatively enlarged scale, taken substantially on the indicated line 5—5 of Figure 1.

Figure 6 is a fragmentary, detail section taken substantially on the indicated line 6—6 of Figure 5.

Figure 7 is a fragmentary, detail elevation, partly in section, taken substantially on the indicated line 7—7 of Figure 6.

Figure 8 is a section similar to Figure 5 representing the elements shown in said latter view as functioning for desired practical effect.

Figure 9 is a fragmentary, detail section taken substantially on the indicated line 9—9 of Figure 8.

It is a common and wide-spread practice to bind and finish the edges of flat members, such, particularly, as belts, wallets, and the like, by means of a spiral lacing developed through looping of a continuous, flexible strip or thong over, about, and along the edge through a succession of spaced holes intersecting the member in an alignment inwardly paralleling the edge. Spiral edge lacings, particularly as applied to leather goods, and the like, have been hitherto largely, if not entirely, manual operations of disproportionate expense and variable quality, hence the instant invention is directed to the provision of apparatus for the mechanical application of such lacings with celerity, uniformity, and economy.

In the typical apparatus illustrated, a lacing head **15** is formed of any suitable rigid material in a size and dimensional proportion adapted to its purposes and is longitudinally traversed by a straight, cylindrical bore **16** of considerable diameter which opens through both ends of said head and which communicates with a radially-associated throat **17** longitudinally intersecting one wall of said head. The head **15** is rigidly mounted, as at **18**, on any appropriate fixed base, to dispose the axis of its bore substantially horizontal and the throat **17** horizontally coplanar with said bore axis at the side of the head accessible to an operator. Throughout its length, the cylindrical wall of the bore **16** is spirally intersected by a continuous groove or thread **19** of a uniform pitch corresponding with that of the desired edge lacing convolutions and a depth and width appropriate to loosely accommodate the strip or thong utilized for the lacing. Tangentially intersecting the wall of the bore **16**, and hence opening through the roots of the groove or thread **19** convolutions, a plurality of like bores **20**, in this instance three in number, is formed in angularly-spaced relation to axially parallel said bore **16** longitudinally of the head **15** walls and to each rotatably accommodate a straight, cylindrical feed roller **21** coextensive in length with the said head **15**. The rollers **21** are journaled at the output end of the groove or thread **19** by means of spindles **22** engaged in bearings formed in the adjacent end of the head **15**, and at the input end of said groove or thread said rollers are provided with coaxial shaft elements **23** journaled in and extending through bearing caps **24** removably and replaceably secured to the adjacent head **15** end in covering relation with the otherwise open ends of the bores **20**. Exteriorly of the head **15**, each of the shaft elements **23** mounts a pulley **25** in coplanar relation with and of the same size as the other like elements and a belt **26** in driven relation with a pulley **27** on the drive shaft of an electric motor **28** similarly and simultaneously engages with and to synchronously and correspondingly drive all of the pulleys **25**. The motor **28** is served by a power supply line **29** through a switch **30** within convenient reach of an operator, thus to provide that closing of said switch **30** establishes uniform and unidirectional rotation of the feed rollers **21** within the walls of the head **15**. The rollers **21** are identically faced throughout their lengths with a smoothly-cylindrical covering **31** of material, such as rubber, having a high frictional coefficient and a moderate yieldability, the exterior diameter of such covering being freely rotatable in the associated bore **20** and such as will peripherally intrude within the radial depth of the groove or thread **19** convolutions intersected by said bore.

Sized to extend the length of and to slidably telescope in substantially filling relation within the bore **16** of the head **15**, a smoothly-cylindrical, rigid mandrel **32** is fixed at one end to a coaxial, hollow stem **33** fixedly engaged with a slide bracket **34** shiftable along tracks **35** extending from the thread or groove output end of the head

15 in parallel alignment with the axis of the head bore 16, thus to mount said mandrel for reciprocation axially of the bore 16 in reaction to shift of the bracket 34 on its mounting tracks 35, the range of bracket 34 travel on its tracks 35 being such as to enter the mandrel through the full length of the bore 16, or, alternatively, to fully clear the mandrel from said bore. Disposed to register with the throat 17 of the head 15, a groove 36 intersects and extends the length of the mandrel 32 exterior surface in a width and depth appropriate to accommodate the edge of the member to be laced, as will hereinafter appear. Controlled feed of the mandrel 32 axially of the head bore 16 in either direction is had through the agency of a feed screw 37 threadedly coacting with and through the end of the stem 33 remote from the mandrel in coaxial relation with said stem by virtue of a rotatable mounting in a bracket 38 upstanding from the outer end of the tracks 35; said feed screw 37 being powered for rotation in either direction by a reversible motor 39 served by a supply line 40 through a reversing switch 41 and driving said screw through suitable speed-reducing means represented by the box 42. The switch 41 being within convenient reach of the operator, shift of the mandrel axially of the head bore 16 in either direction and to any desired extent is available at option.

Completing the structural organization of the illustrated apparatus, the end of the mandrel 32 directed toward the input end of the groove or thread 19 is spirally cammed, as at 42', into conformity with the pitch of said groove or thread convolutions.

In the practical use of the mechanical edge lacer shown and described, the member to be edge-laced, fragmentarily represented at 43 in Figures 8 and 9, is first conditioned in a usual manner, and by any appropriate facilities, through the development therein of a row of like lace holes 44 sized to freely pass the lacing strip or thong 45 to be applied and aligned in a uniform spacing corresponding to the pitch of the groove or thread 19 convolutions to parallel the edge of the member to be laced at a distance inwardly from said edge such as will register the said holes 44 with the openings of the groove or thread convolutions exposed through the floor of the head throat 17 when the said member edge is entered through said throat and within the groove 36 of the mandrel 32, all as represented in the views last above noted.

The member 43 to be laced having been conditioned as above set forth, the mandrel 32 is shifted in the manner and by the means above described to fill the head bore 16, to register its groove 36 with the head throat 17, and to establish the groove or thread 19 convolutions as a continuous spiral passage thereabout interrupted only by the throat 17, whereafter the conditioned edge of the member 43 is entered through said throat 17 and within the said groove 36 and therein adjusted to register its holes 44 with the groove or thread 19 convolutions interrupted by the floor of said throat, and the end of an appropriate length of lacing strip or thong 45 is entered through the hole 44 at the groove or thread intake end and downwardly within the groove or thread spiral passage immediately below and to engagement with the proximate roller 21 covering 31 partially obstructing said passage. With the strip or thong 45 end entered as recited, the switch 30 is closed to energize the motor 28 and to consequently rotate the feed rollers 21 in a direction effective to draw the strip or thong 45 through and along the spiral passage defined by the groove or thread 19 convolutions about the mandrel 32, thus advancing the strip or thong free end axially of and about the mandrel and through the successive holes 44 of the member 43 registered in the path of its travel. When a length of strip or thong 45 adequate to the capacity of the apparatus or to the completion of the desired operation has been wound about the mandrel 32 and through the initial stretch of holes 44, the motor 39 is energized through the agency of the switch 41 to slowly retract the mandrel relative to the head 15 for gradual and successive release over and by virtue of its cammed end 42' of the strip or thong windings thereabout, such retraction of the mandrel uncovering inner aspects of the groove or thread 19 convolutions for escape therefrom of the strip or thong windings previously confined therein and establishing such released windings as closed loops 46 within the head bore 16 and each through one of the holes 44 of the member 43. With the motor 28 continuing to drive the feed rollers 21 as the mandrel is gradually retracted from the head 15, winding of the strip or thong 45 about the mandrel continues and is effective to progressively reduce the freed winding loops 46 and to draw the latter down closely about the member 43 edge as successive lacing bights 47, whereof the tension and tightness is regulated and determined by the operator through control of the rate of mandrel retraction from the head and its bore 16, full retraction of the mandrel from the head releasing the last of the strip or thong windings and concluding a given operation of the apparatus.

Since changes, variations, and modifications in the form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention:

1. A spiral edge lacer comprising a head formed with a cylindrical bore and a slot radially of said bore through a wall of the head, a cylindrical mandrel slidably filling and reciprocable axially of said bore, a groove longitudinally of said mandrel in registration with said slot, a spiral channel interrupting the wall of the head bore about and to open against the mandred position therein and coactable with the mandrel exterior surface to define a spiral passage continuous save for interruption by said slot, feed rollers mounted for rotation in and longitudinally of said head in axial parallelism with said bore end tangentially obtruding within and similarly intersecting the successive convolutions of said channel, means for synchronously and correspondingly rotating said feed rollers, and means for optionally shifting said mandrel in either direction axially of the head bore.

2. A spiral edge lacer comprising a head formed with a cylindrical bore and a slot radially of said bore through a wall of the head, a cylindrical mandrel slidably filling and reciprocable axially of said bore, a groove longitudinally of said mandrel in registration with said slot, a spiral channel interrupting the wall of the head bore about and to open against the mandrel position therein and coactable with the mandrel exterior surface to define a spiral passage continuous save for interruption by said slot, a plurality of like rollers journaled in said head and angularly spaced about and axially paralleling the head bore for rotation relative to the head in tangentially obtruding relation with the successive convolutions of said channel, means for synchronously and correspondingly rotating said rollers, and means for optionally shifting said mandrel in either direction axially of the head bore.

3. The organization according to claim 2, wherein the head-entering end of said mandrel is spirally cammed to the pitch of the spiral channel convolutions for covering and uncovering coaction with a full circle of successive said convolutions as the mandrel is shifted axially of the head.

4. The organization according to claim 2, wherein a hollow stem outstands in fixed, coaxial relation from one end of the mandrel in fixed engagement with a slide bracket shiftable exteriorly of the head along a path paralleling the head bore axis, and the means for optionally shifting the mandrel in either direction axially of the head bore comprises a rotatably-mounted feed screw threadedly and coaxially engaged with the end of said

stem remote from the mandrel, and a motor in reversible driving relation with said screw.

5. The organization according to claim 2, wherein said rollers are exteriorly surfaced with resiliently-yieldable material characterized by a high coefficient of friction, whereby to condition the rollers to surface grip with driving effect against passage-confined elements thereby engaged.

6. The organization according to claim 2, wherein the means for synchronously and correspondingly rotating said rollers comprises spacedly-parallel like shaft elements fixedly and coaxially outstanding beyond the head from the corresponding roller ends, like pulleys fixed in co-

planar relation to said shaft elements, an endless belt in like driving relation with all said pulleys, and a motor in powering relation with said belt.

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