Oct. 8, 1929. W. BERRY 1,730,840

APPARATUS FOR CUTTING TEXTILE FABRICS

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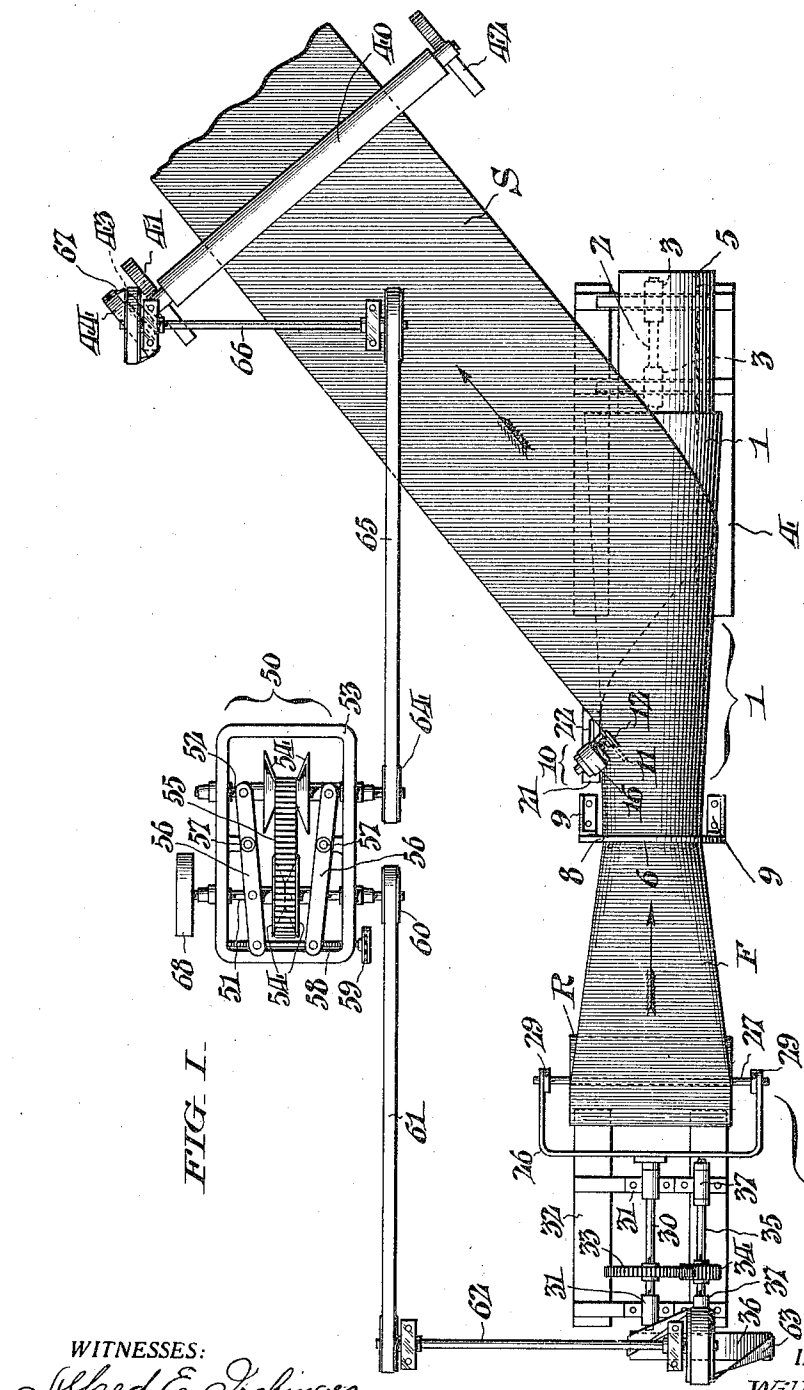


FIG. 1.

WITNESSES:
Alfred E. Ischinger
Thomas W. Kerr, Jr.

INVENTOR:
William Berry,
BY Fraley & Paul
ATTORNEYS.

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FIG. II.

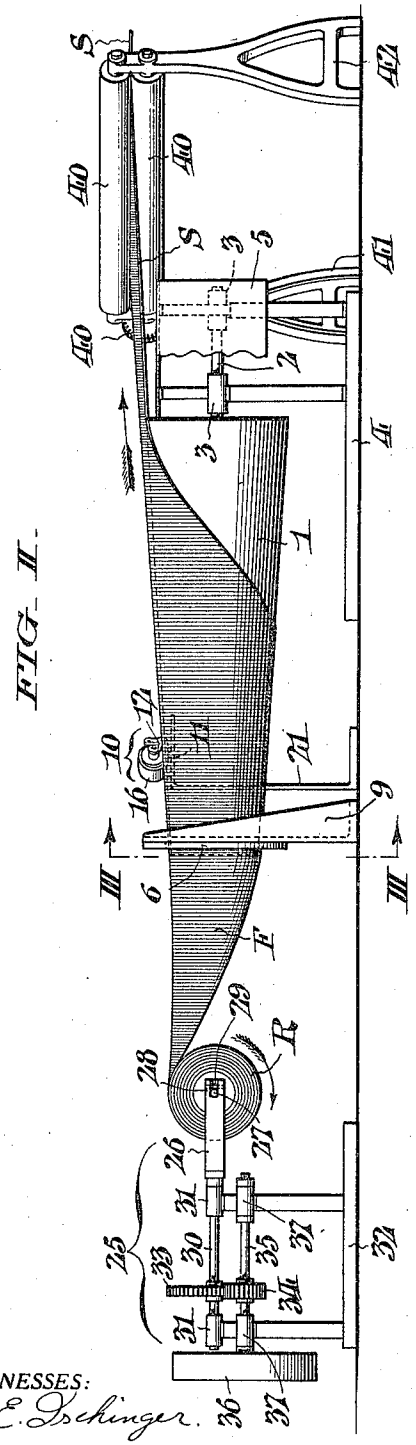


FIG. IV.

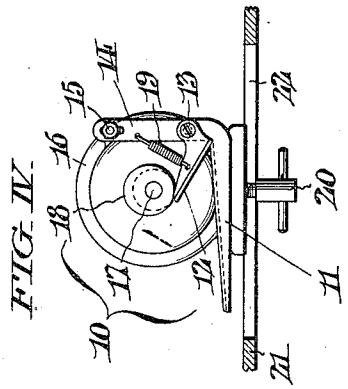
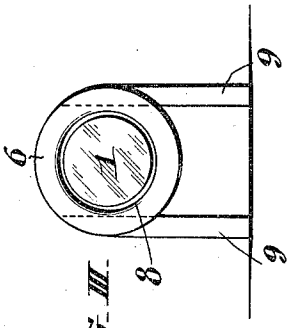


FIG. III.



WITNESSES:
Alfred E. Ischinger.
Thomas W. Kerr, Jr.

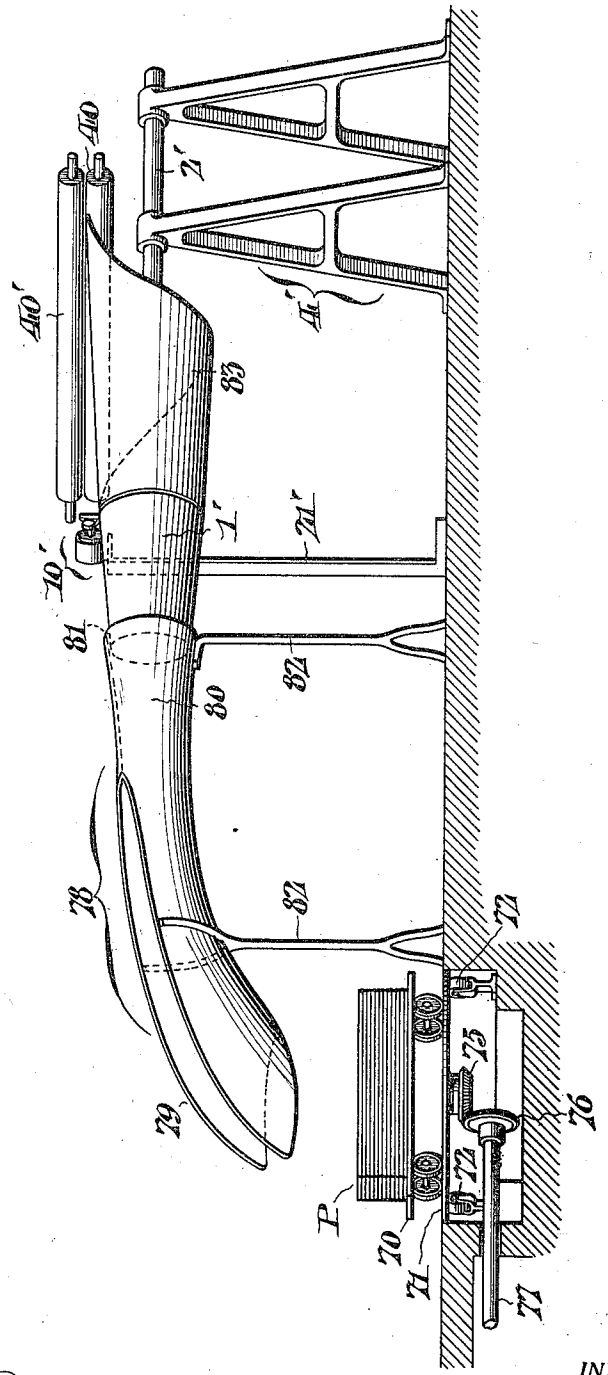
INVENTOR:
William Berry,
BY Fraley & Paul
ATTORNEYS.

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APPARATUS FOR CUTTING TEXTILE FABRICS

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FIG. V.



WITNESSES:
Alfred E. Tschinger
Thomas W. Fern, Jr.

INVENTOR:
William Berry,
BY Fraley & Paul
ATTORNEYS.

Patented Oct. 8, 1929 1,730,840

UNITED STATES PATENT OFFICE

WILLIAM BERRY, OF WILMINGTON, DELAWARE, ASSIGNOR TO JOSEPH BANCROFT & SONS CO., OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE

APPARATUS FOR CUTTING TEXTILE FABRICS

Application filed January 29, 1924. Serial No. 689,350.

This invention is concerned with the cutting of textile fabric,—more specifically bias cutting—i. e., into a strip wherein the warp and weft threads occupy angular positions relative to the side edges of the strip. As is well known, such strips are, as the result of bias cutting, capable of withstanding greater longitudinal and lateral strains than a corresponding width of the original fabric, and are therefore preferred in the arts where the consideration of elasticity is highly important, for example, in close wrapping or covering of wire; in securing thermo-insulating material about pipes or conduits; and in the manufacture of vehicle tires; etc.

Concisely stated, the main objects of my invention are to enable fabric woven in tubular form to be cut into a perfect, undistorted, continuous bias strip of uniform width, and to provide a simple and efficient apparatus for this purpose.

Other objects and attendant advantages will become apparent from the detailed description of my invention which follows, while its scope will be as readily appreciated from the appended claims.

In the drawings, Figure I is a plan view, more or less diagrammatically represented, of a cutting apparatus conveniently typifying this invention.

Figure II is a side elevation of the same, the driving connections being omitted in this instance to avoid unnecessary duplication and possible confusion.

Figure III is a view taken as indicated by arrows III—III in Fig. II.

Figure IV is a detail illustration of the cutting means with the mounting therefor in section, this illustration being on a larger scale than the others; and,

Figure V is an illustration similar to Fig. II, showing an alternative embodiment of my invention.

Referring first more particularly to Figs. I and II of the drawings, it will be observed that the tubular fabric indicated conventionally at "F" is supplied from a bolt or roll "R" and passed over and about a guide in the form of a drum 1. This drum is made slightly tapered as shown so as to facilitate opening and passage thereover of the tubular fabric "F," and for another purpose to be hereinafter explained. The drum 1 may be made solid, although to secure the advantages of lightness, it is preferably constructed of sheet metal. This drum 1 is fastened upon an axially disposed shaft 2 that extends beyond the larger end of said drum, where it is fixed against rotation in clamp bearings 3, which are supported at a convenient height from the floor by an appropriate framework comprehensively indicated at 4. A guard 5 of sheet metal or the like extends about one side and over the top of the bearings 3 to prevent access of the fabric "F" to them. By the described arrangement, the drum 1 is supported entirely free of obstruction so that the fabric "F" may move freely over and along the same.

Spreading and smoothing of the tubular fabric "F" to ensure uniform distribution thereof circumferentially about the drum 1 is accomplished with the assistance of a member comprehensively indicated at 6 in the drawings. This member 6 in this instance is in the form of a ring through which the smaller or receiving end of the drum 1 projects and cooperates to form a comparatively narrow annular opening 8 through which the tubular fabric "F" is passed. In practice the clearance between the surface of the drum 1 and the ring 6 is made sufficiently large to permit ready self adjustment and distribution of the fabric "F" without drag or injurious tension. A pair of uprights 9 rising from the floor serve to support the member 6 in fixed relation to the drum 1.

As a result of combined longitudinal and rotational progression induced in a manner to be presently explained, the tubular fabric "F" is moved spirally of the drum 1 to and past a cutting means shown at 10. This cutting means 10 is located at the surface of the drum 1, and comprises a fixed horizontal shear blade 11, and a cooperating movable shear blade 12 which is pivoted at 13 to an integral upright extension or arm 14 of the fixed blade 11. This arm 14 is secured by one or more bolts 15 to the frame of an electric motor 16 provided for actuating the movable

blade 12. To the shaft 17 of the motor 16 is affixed an eccentric cam 18 wherewith the movable shear blade 12 is maintained in operative contact by a contactile spring 19 in tension between said movable shear blade 12 and the arm 14 of the fixed blade 11. Thus, by operation of the motor 16, the movable shear blade 12 is constantly vibrated toward and away from the fixed blade 11. In order to permit adjustment of the shear blades 11, 12 relative to the drum 1 for the purpose of varying the angle of the bias cut, a swivel clamp screw 20 is employed to fasten the motor 16 to a bracket 21 provided for its support. The clamp screw 20 passes through an elongated slot 22 in the bracket 21 so that the cutting means 10, in addition to capacity for angular adjustment as above explained, can be bodily shifted in a direction parallel to the axis of the drum 1 to properly position the shears 11, 12 at the region where the tubular fabric "F" is substantially expanded on the drum 1, or as required for tubular fabrics of different diameters.

Rotative movement of the fabric "F", while passing over the drum 1, may be imparted for example, through bodily rotation of the bolt or roll "R" from which said fabric is supplied. To this end, I provide a rotating holder device for the fabric bolt or roll "R" which holder device 25, as shown in Figs. I and II of the drawings, is located somewhat in advance of the drum 1. This holder 25 comprises a yoke 26 between the extremities of which an axle shaft 27 for the bolt or roll "R" is removably mounted to permit substitution of a new bolt or roll for one previously exhausted. A simple arrangement enabling such substitution is by recessing the extremities of the yoke 26 as shown at 28 to receive and support the ends of the axle shaft 27, and by employing removable pins 29 to retain said shaft ends in place in the recesses 28. The yoke 26 is fixed to the end of a shaft 30 which is preferably axially aligned with the drum 1 and journalled in bearings 31 on the frame 32 of the holder device 25. The shaft 30 is rotated through intermeshing of a gear wheel 33 thereon with a gear pinion 34 on a drive shaft 35 having a pulley 36 at one end, said shaft 35 being in turn journalled in bearing 37 also supported by the frame 32. The ratio of the gear couple 33, 34, it will be observed, is such that the shaft 30 is driven at a speed considerably reduced compared to that of the drive shaft 35. As a consequence of the rotative movement imparted to the tubular fabric "F" by the means just described, and by virtue of the ample interval between the device 25 and the receiving end of the drum 1, said fabric yields readily to being opened in passing to said drum 1, such opening being greatly assisted by the spreading and smoothing action of the member 6. Attention is also directed to the fact that the roll or bolt "R", by reason of its free mounting in the yoke 26 of the holder device 25, will respond readily to turning in satisfying the longitudinal progression of the fabric "F" which is induced as already stated, concurrently with rotation, to determine spiral travel on the drum 1.

As the fabric "F" is passed edge-wise between the shears 11, 12, it follows, in view of the spiral movement on the drum 1, that it is cut at an angle with resulting production of a single continuous flat bias strip "S". This strip "S" is drawn tangentially at an angle from the surface of the drum 1 by superposed nip or draft rolls 40 whose axes are inclined to that of the drum 1, as shown in Fig. I, to determine the desired angular travel of the cut strip "S". The draft rolls 40 are journalled at opposite ends in bearings of appropriate upright frames 41, 42, and are driven through a speed reducing gear couple 43, in turn actuated by a pulley shown at 44 in Fig. I. By this arrangement, it will be obvious that the pull upon the cut strip "S" not only causes the fabric "F" to be drawn between the cutting blades 11, 12, but also longitudinal progression of the fabric along the drum 1. Furthermore the pull on the strip "S" tends to assist rotation of the fabric "F" on the drum 1. By use of my improved apparatus, the fabric "F" may be easily cut or split by a very light pull on the strip "S" to the avoidance of any injurious straining, the cutting means 10 being in practice adjusted to prevent any such contingency, to a point in advance of the region of full expansion of the fabric tube "F" on the drum 1 so that said fabric tube "F" can never be stretched to the extent of resisting its progress on the drum 1. By using a drum 1 with the proper taper, and by properly controlling the speed of the revolving holder 25—as hereinafter explained—I am able to ensure delivery of the material to the cutting means 10 in a loosely expanded and slightly tensioned condition, and to effect spiral movement of the fabric "F" through the cutting means 10 without necessitating the aid of drawing devices other than the nip rolls 40. In many cases, it is quite possible to cut without motion of the shear blades 11, 12, the pull on the strip "S" sufficing without additional aid. In the case of fabrics of a softer texture, motion of the shear blades 11, 12 is desirable so that stretching or distortion may be avoided.

In order to obviate drag upon the strip "S" such as might occur through sluggish rotation of the holder device 25, I make provisions whereby the speed of rotation of said device 25 and that of the draft rolls 40 can be compensatively adjusted to maintain movement of the strip "S" in absolute synchronism with the movement of the tubular

fabric "F". This I accomplish in the present instance by employing an adjustable speed control device or "transformer" 50 to function as a common drive for the holder device 25 and the draft rolls 40. This adjustable speed transformer 50 is of standard construction comprising a primary or power shaft 51 and a driven shaft 52 extending parallel thereto. Upon each of said shafts 51, 52 within the frame 53 of the transformer, are mounted a pair of separable opposed conical disks 54 constituting, in effect, expansible pulleys that are connected for cross driving by a composite belt 55 whose link sections have their opposite ends sloped to cooperate with the inclined surfaces of the disks 54. A pair of levers 56, pivoted intermediate their ends at 57 to the frame 53, are connected to the disks 54 in suchwise as to cause approach of one pair of said disks simultaneously with the separation of the other. Under this action, the belt 55 is obliged to change its position relative to the conical faces of the respectively paired disks 54, with the result that the rotative speeds of the two shafts 51, 52 are correspondingly changed. Adjustment of the levers 56 is accomplished by a compound screw 58 having secured to it a sprocket 59 for hand chain operation when the speed transformer 50 is mounted overhead, as here shown. The shaft 51 of the transformer 50 carries a pulley 60, which, through a belt 61, is connected with a pulley shaft 62 directly over the holder device 25, the shaft 62 being in turn connected through a belt 63 with the pulley 36 of said holder device 25. The other shaft 52, of the speed transformer 50, has affixed to it a pulley 64 which by means of a belt 65 serves to drive an overhead pulley shaft 66, and the latter shaft in turn through a belt 67 actuates the pulley 44 of the nip or draft rolls 40. Power is transmitted from any convenient source (not shown) to the speed transformer 50 over a pulley 68 on the shaft 51. It is to be understood that any other type of speed control may be employed, in lieu of the transformer 50 herein shown, for the purpose specified. However, regardless of the type of speed transformer 50 used, with driving connections made as above, the rotative movements of the holder device 25 and the draft rolls 40 may be so adjusted relatively as to maintain the desired synchronism between the progression of the fabric tube "F" on the drum 1, and the linear travel of the bias cut strip "S".

In the embodiment of my invention shown in Fig. V, corresponding parts to those previously described are designated by similar primed reference characters, while provision is made to facilitate delivery of the tubular fabric "F" to the cutting means 10′ from a stack or pile "P". As shown the truck 70 whereby the material is conveyed to the apparatus is transferred to a turn table 71 designed to revolve on a number of rollers 72. The turn table 71 is arranged to be driven by bevel gears 75, 76 from a shaft 77 which may be coupled with a speed transformer, such as hereinbefore described, so that the pile "P" is constantly rotated and the tubular fabric "F" revolved in passing to the drum 1′ as in the first embodiment. As a means to assist opening of the fabric "F" from its flattened and folded condition in the pile "P" enroute to the drum 1′ I employ, in this instance, an auxiliary guide 78 whose forward or leading end 79 is trough-shaped or semi-circular in cross-section and curved upwardly as shown to the level of the drum 1′ where mergence is effected with a conical rear end portion 80 whose taper corresponds substantially to that of said drum. The conical end 80 of the auxiliary guide 78. it will be particularly noted, overlaps the smaller end of the drum 1′, with allowance of a circumferential interval that constitutes an annular opening 81 to serve in the same capacity as the annular opening 8 hereinbefore referred to. The auxiliary guide 78 may be fixedly supported in any convenient manner as by uprights or standards 82. The drum 1′ of the alternative embodiment of Fig. V although tapered like, and performing the same function as the one shown in Figs. I and II, is considerably shorter in length and supplemented by an extension 83, (which may be either separate or integral) of spiral configuration designed to support and guide the cut strip "S" from the point where it is severed from the tubular fabric "F" by the cutting means 10′ around to a line of departure at which said strip is drawn tangentially from the supplemental guide 83 by the nip or draft rollers 40′. The construction just described permits the nip or draft rollers 40′ to be placed very close to the drum 1′ thereby rendering the apparatus more compact. All other parts not specifically mentioned are identical with those of the first embodiment and have accordingly been marked with primed reference characters. It is of course to be understood that synchronous movement of the nip or draft rollers 40′ and the turn table 71 is to be maintained in precisely the same manner and for the same purpose as aforedescribed.

Having thus described my invention, I claim:

1. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, cutting means at the surface of the drum, rotatable unwinding means feeding the fabric forwards, co-ordinated means for drawing the fabric spirally from the drum past the cutting means and a speed control device intermediate the co-ordinating means.

2. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass,

cutting means at the surface of the drum, co-ordinated means for inducing combined rotational and longitudinal progression of the tubular fabric on the drum to determine spiral movement to and past the cutting means, and speed transforming means intervening the aforesaid co-ordinating means.

3. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, cutting shears at the surface of the drum, and means for continuously drawing the cut strip tangentially at an angle from the drum to determine spiral progression of the tubular fabric to and past the cutting shears.

4. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, adjustable shears at the surface of the drum, drawing mechanism for inducing combined longitudinal and rotatational progression of said tubular fabric on the drum to determine spiral movement to and past the shears including draft rolls for continuously pulling the cut strip tangentially at an angle from the drum, and a co-ordinated rotating holder for a bolt from which the tubular fabric is supplied.

5. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, adjustable shears at the surface of the drum, drawing mechanism for inducing combined longitudinal and rotational progression of said tubular fabric on the drum to determine spiral movement to and past the shears including draft rolls for continuously pulling the cut strip tangentially at an angle from the drum, a co-ordinated rotating holder for a bolt from which the tubular fabric is supplied, and transformer means whereby the speed of said draft rolls and said holder may be compensatively adjusted.

6. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, adjustable shears at the surface of the drum, drawing mechanism for inducing combined longitudinal and rotational progression of said tubular fabric on the drum to determine spiral movement to and past the shears including draft rolls for continuously pulling the cut strip tangentially at an angle from the drum, a rotating holder for a bolt from which the tubular fabric is supplied, and a co-ordinating drive with interposed control means whereby the speed of said draft rolls and said holder may be compensatively adjusted.

7. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, adjustable shears at the surface of the drum, and means for rotating the tubular fabric in its passage over the drum, in combination with means for simultaneously continuously drawing the cut strip tangentially at an angle from the drum to determine spiral movement of said fabric to and past the shears, and a speed control device whereby rotary movement of the fabric and the draft of the cut strip are synchronized.

8. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, cutting means at the surface of the drum comprising a pair of pivoted adjustable shear blades, and means for continuously drawing the tubular fabric spirally of the drum and edgewise between the shear blades.

9. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, cutting means at the surface of the drum comprising an adjustable stationary shear blade, a movable blade pivoted to the fixed blade, a rotating cam for vibrating the movable blade through direct contact therewith, in combination with mechanism for drawing the tubular fabric spirally of the drum and edgewise between the shear blades.

10. In apparatus of the character described, a tapered drum over and about which continuous tubular fabric is adapted to pass, a shear blade cutter at the surface of the drum, means whereby the cutter may be angularly adjusted relative to the drum to vary the angle of the bias cut, and mechanism for drawing the tubular fabric spirally of the drum and edgewise between the shear blades.

11. In apparatus of the character described, a drum tapered to assist opening of uninterrupted tubular fabric in being passed thereover, drawing mechanism for inducing spiral progression of the fabric on the drum, and cam actuated shears at the surface of the drum for cutting the spirally advancing tubular fabric into a continuous bias strip, said shears being adjustable longitudinally of the drum to enable positioning at the region where the tubular fabric is substantially fully expanded.

12. In apparatus of the character described, a stationary tapered drum over and about which uninterrupted tubular fabric is adapted to pass, drawing mechanism for inducing spiral progression of the fabric on said drum, and adjustable shears at the surface of the drum for cutting the spirally advancing fabric into a continuous bias strip.

13. In apparatus for cutting bias strip from tubular fabric the combination of, a taper drum over and about which the fabric is adapted to progress, cutting means at the surface of the drum, rotatable unwinding means feeding the fabric forward, co-ordinated means for drawing the fabric spirally from the taper drum, and speed-controlling means intermediate the co-ordinating means.

14. In apparatus for cutting bias strip

from tubular fabric, the combination of a taper drum over and about which the tubular fabric is progressed without expansion productive of frictional resistance to its free movement, cutting means positioned at the surface of the drum in advance of the region of full expansion of the tubular fabric, rotatable unwinding means feeding the fabric forward, co-ordinated means for drawing the tubular fabric spirally from the drum, and a compensative speed-controlling device intermediate the co-ordinating means functional to substantially eliminate tension on the fabric at the cutting zone.

In testimony whereof, I have hereunto signed my name at Wilmington, Delaware, this 26th day of January, 1924.

WILLIAM BERRY.