

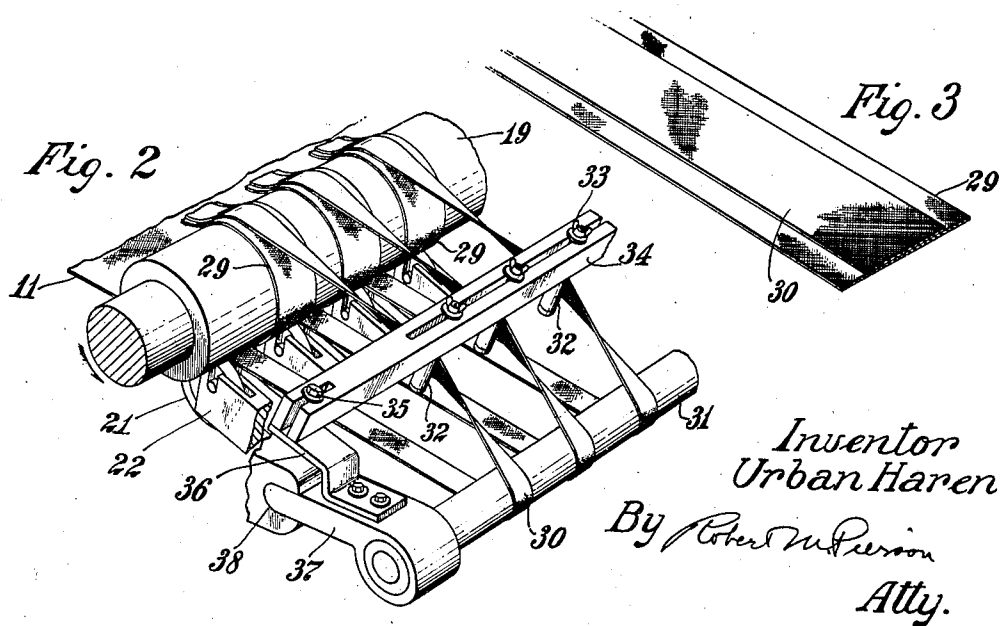
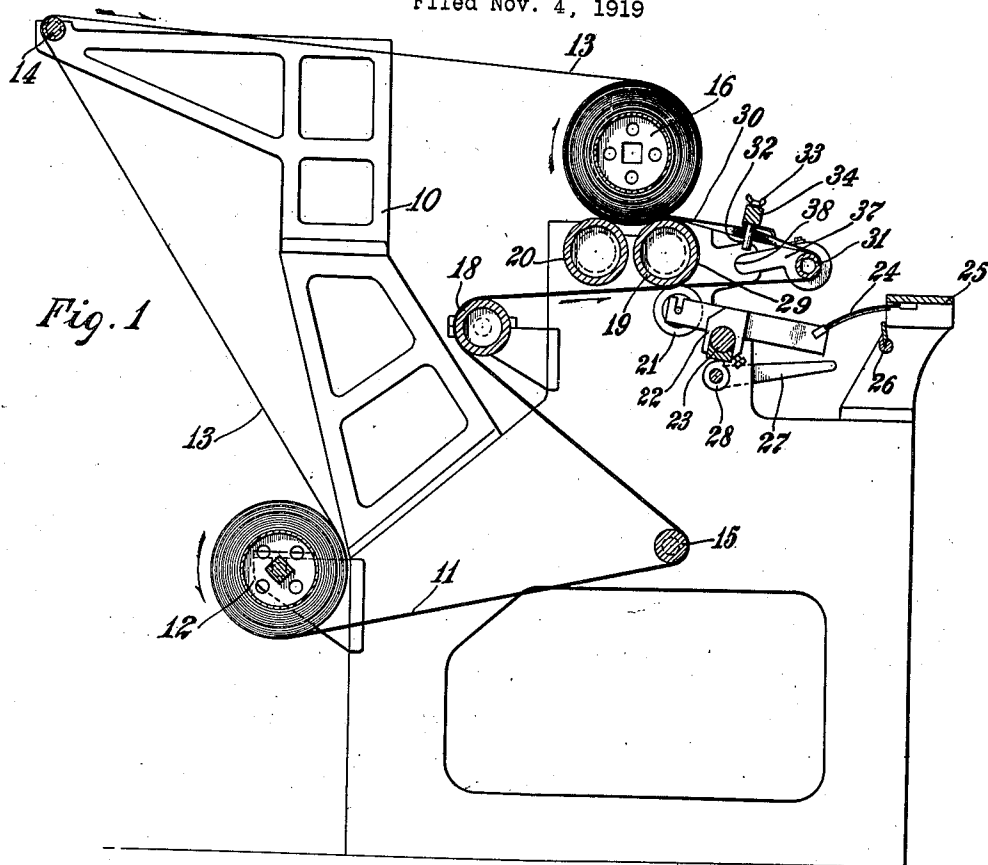
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METHOD AND APPARATUS FOR BUILDING LAMINATED STRIPS

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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR BUILDING LAMINATED STRIPS.

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To all whom it may concern:

Be it known that I, URBAN HAREN, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented a certain new and useful Method and Apparatus for Building Laminated Strips, of which the following is a specification.

This invention relates to the manufacture of laminated fabric or other flexible sheet structures in strip form, and its object is to provide a means for rapidly and accurately plying together a plurality of strips of material cut from the same sheet. The invention may be applied, for example, to the manufacture of laminated rubberized fabric strips for making bicycle tires, which have commonly been laid up by hand, and in this and similar connections it will effect large savings and secure a better product.

Of the accompanying drawings:

Fig. 1 is a longitudinal sectional view through a fabric cutting and plying apparatus constructed according to my invention and adapted to perform the process involved therein.

Fig. 2 is a detail perspective view of the cutting and plying devices.

Fig. 3 is a perspective view of one form which the product may take as a result of the operation of said apparatus.

In these drawings, 10 is the machine frame and 11 is the sheet of material which may, for example, consist of a number of spliced lengths of bias-cut rubberized fabric from which the ply strips are to be cut, this material being carried on a roll 12 on which it is wound together with a liner 13. The fabric and liner are separated as they leave the roll and drawn around idle rollers 14, 15, the liner passing from the idler 14 to a receiving roll 16, while the fabric passes around a second idle roller 18 and under a roller 19 on which it is cut into strips, the strips being then plied together in pairs and passing onto the receiving roll 16, where the fabric, now cut and plied, is again wound up with the liner 13. The roll of liner and cut fabric is carried and preferably rotated by the rollers 19, 20 which are power-driven by suitable mechanism (not shown) to draw the liner and fabric from the roll 12, and to

draw the fabric through the cutting and plying means.

The sheet-cutting or slitting means may be of any suitable type, the illustration showing a familiar arrangement including a row of transversely-spaced circular disk knives 21 which bear against the roller 19 and cut the sheet as it passes over this roller. The said knives are freely journaled on the ends of a series of levers 22 which are mounted on a rocking bar 23 and adapted to be adjustably secured thereon in order that the spacing of the knives lengthwise of said bar may be changed to vary the widths of the strips, said levers having leaf-springs 24 on their rear ends. The knives are adapted to be raised and lowered as a group by means of cams 28, of which one is shown, on a rock-shaft oscillated by a handle 27, and when they are elevated into operative position they are yieldingly held against the roll 19 by the pressure of the springs 24 against a cross frame member 25, said springs resting on a stop 26 when the knives are dropped downwardly out of contact with the fabric.

In this case the knives 21 are adjusted to cut the fabric into a series of strips of two different widths, the relatively-wide strips alternating with the relatively-narrow strips. My invention provides for continuously superposing one strip upon another to make, in this instance, simultaneously, a number of two-ply strips with narrow plies superposed upon broader ones as clearly shown in Figs. 2 and 3, 29 being the broad and 30 the narrow plies.

31 is a loosely-journaled forward guide-roller for the narrow or upper plies which are to be superimposed upon the broad or lower plies, mounted parallel to the roller 19. Transversely mounted with respect to said rollers 19 and 31, with their axes in nearly vertical positions, are a series of individual guide members or rollers 32, the upper ends of whose shafts are secured by thumb-nuts 33 on a slotted bar 34 so that said guide members may be fixed in different adjustments longitudinally of said bar. The function of these members, in conjunction with the guide-roller 31, is to deflect each narrow fabric strip 30 from a path

alongside of its neighboring wider strip 29 to a path overlying that of the wider strip. Bar 34 is slotted at its ends and adjustably secured by bolts 35 on frame brackets 36, so that the guide members 32 may be shifted as a group laterally of the path of travel of the strips. Frame members 37 which carry the bar brackets 36 and the bearings of roller 31 are detachably mounted in sockets 38 on the main frame so that the guiding unit formed by the rollers 31, 32 and their supports, may, if desired, be detached, and the strips cut and wound without being plied. Or this unit may be left in place when the operation is thus changed.

It will be evident that in the normal operation of this machine the wider strips 29, as they leave the line of cutting points on the under side of the roller 19, are looped or carried around on the surface of said roller for about half a turn and are joined on the upper side thereof by the narrower strips 30 which have gone forward from the line of knives, been looped or turned back around the roller 31, deflected over the broader strips by the small rollers 32 to register the two sets of strips, and superimposed upon said broader strips by reason of the mode in which they are guided upon the latter, the weight of the roller 16 and the roll of material thereon furnishing pressure which promotes the adhesion of the two plies to each other. The thus-plied strips, whose laminations are united by their adhesive surfaces, are then wound up with the liner 13 on the roll 16, and after said roll is full it is removed and ready to be used as a roll of stock for further manufacturing operations such as the cutting of the plied strips into lengths for making bicycle tires. The adjustment of the guide-members 32 determines the positions of the narrow plies with reference to the broad ones, which in this case is midway of said broad plies, but it is evident that any other relative lateral position and any desired relative width may be secured by suitable adjustment of the guide rollers and knives. The invention is not limited as to the kind of flexible material or the number of laminations in the plied strip or strips.

I claim:

1. The herein-described method which comprises progressively drawing a sheet of flexible material and a liner from a stock roll in which they are interwound, progressively slitting said material longitudinally, as it is so withdrawn, into a plurality of strips, progressively superimposing one of said strips upon another to make a laminated strip, and interwinding said laminated strip into a roll with a liner.

2. The herein-described method which comprises progressively drawing a sheet of flexible material and a liner from a stock roll

in which they are interwound, progressively slitting said material longitudinally, as it is so withdrawn, into a plurality of strips, progressively superimposing one of said strips upon another to make a laminated strip, and guiding said liner and said laminated strip progressively into flatwise contact with each other.

3. The herein-described method which comprises progressively and continuously slitting a sheet of material into a plurality of relatively wide strips, guiding some of the strips individually and flatwise onto other of the strips, thereby forming a plurality of laminated strips, and winding the latter into separate coils upon a common support and in interwound relation with a liner common to said coils.

4. The method of making laminated strips which comprises progressively slitting a sheet of flexible material into strips, progressively feeding one of said strips from slitting position through a path such that it moves without substantial flexure or torsion to a turning position and is there flexed flatwise, on lines at right angles to its length, its course being thus substantially changed, progressively feeding an adjacent strip from slitting position so that it similarly moves to a turning position beyond that of the first strip and is there similarly turned in the direction taken by the first strip, and guiding the second strip into flatwise, face to face contact with the first strip as said strips move from said turning positions.

5. The method of making a laminated strip which comprises progressively and successively slitting a sheet of flexible material into adjoining relatively wide and narrow strips, turning back a wide strip in a relatively short loop, turning back the adjoining narrow strip in a longer loop, deflecting said narrow strip over the wide strip and superimposing it thereon.

6. The method of making a laminated strip which comprises progressively and successively slitting into strips a sheet of fabric which is coated with adhesive material, turning back adjoining strips in relatively long and short loops, deflecting the strip of the long loop over the other, and causing the adhesive surfaces of the superimposed strips to unite.

7. In a strip cutting and laminating machine, the combination of means for progressively feeding flexible sheet material and slitting it into strips, means for so guiding neighboring strips that they move from slitting position to turning positions differing substantially in their distance from slitting position and that their general direction of movement is there substantially and similarly reversed, and means, acting on one of said strips after it has passed its turning position, for guiding it onto the other strip.

8. In a strip cutting and laminating machine, the combination of means for progressively feeding flexible sheet material and slitting it into strips, means for turning back adjoining strips in relatively short and long loops, means for deflecting the strip of the short loop to register it with the other, and means for superimposing it thereon.

9. In a strip cutting and laminating machine, the combination of a roller, means for supplying flexible material in sheet form thereto, means for longitudinally slitting the material on said roller into strips, means for causing one such strip to loop around the roller, and for causing a neighboring strip to be superimposed thereon, and means for looping back said neighboring strip at a longitudinally advanced point and deflecting it to register with the first-said strip.

10. In a strip cutting and laminating machine, the combination of means for progressively supplying flexible material in sheet form, means for longitudinally slitting said material into strips, means for turning back one such strip in a loop and for superimposing thereon a neighboring strip, a roller located in a longitudinally-advanced position for looping back said neighboring strip, and means located between said rollers for deflecting the returning portion of said neighboring strip into register with the first-said strip.

11. In a strip cutting and laminating machine, the combination of means for progressively supplying flexible material in sheet form, means for longitudinally slitting said material into strips, devices for turning back adjacent strips in loops of different lengths, strip guiding means positioned between the two loop-turning devices and adapted to act on the returning portion of the longer loop in a plane transverse to its normal plane of movement to deflect it laterally into registering with the other strip, and means for leading it onto said other strip.

12. In a strip cutting and laminating machine the combination of means for progressively supplying flexible material in sheet form, means for longitudinally slitting said material into strips, means for turning back one of said strips in a relatively-short loop and for superimposing thereon a neighboring strip, a longitudinally-advanced roller for looping back said neighboring strip, and a strip-guiding member positioned at an angle to the axis of said roller, between the latter and the first-said looping means, for deflecting the returning portion of said neighboring strip into register with the first-said strip.

13. In a strip cutting and laminating machine, the combination of a pair of rollers adapted to bring together between them two superimposed strips of flexible mate-

rial, means for supplying the material to one of said rollers in sheet form, means co-acting with said roller for slitting the material longitudinally into strips, one of which turns around said roller to join a neighboring strip means for leading off and turning back said neighboring strip, and means for deflecting it into register with the first-said strip.

14. In a strip cutting and laminating machine, the combination of a sheet-feeding and strip-turning roller, means for supplying a sheet of flexible material thereto, a slitting knife coacting with said roller, a second roller coacting with the first roller to bring together a pair of the strips which have been slit apart by said knife and adapted to wind up the laminated strip, and means for leading off one of the strips and returning it upon the other between said rollers.

15. In a strip cutting and laminating machine, the combination of means for progressively feeding flexible sheet material and slitting it into strips, means for varying the width of said strips, means for turning back one of said strips in a loop, means for leading off and returning a neighboring strip and for superimposing it upon the first strip, and laterally adjustable deflecting means acting upon the returning portion of said neighboring strip.

16. In a strip cutting and laminating machine, the combination of means for longitudinally feeding a sheet of flexible material, a plurality of knives for slitting said sheet into individual strips for making a series of laminated strips, means for looping back one set of strips and for superimposing thereon the strips of the other set, means for leading off and returning the strips of said other set, a series of deflectors for causing the returning portions of the last-said strips to register with the strips of the first-said set, and supporting means for said deflectors, adjustable to shift them laterally as a group.

17. In a strip cutting and laminating machine, the combination of means for progressively feeding flexible sheet material and slitting it into strips, said means including a roller for turning back one of said strips and receiving thereon a superimposed neighboring strip, said roller being also adapted alternatively to turn back both of said strips, and a guiding and deflecting unit removably positioned in coactive relation to said roller and having means for leading off and returning said neighboring strip and deflecting it into register with the first-said strip.

18. In apparatus for building laminated strips the combination of a source of supply for said material, means for progressively slitting said material into strips as it is drawn from said source of supply, a roll

so positioned as to be adapted to support one of said strips flatwise on its periphery as said strip passes from slitting position, without substantial twisting of said strip, 5 a guide member spaced apart from said roll and about which another of said strips, passing from slitting position, may be looped and then returned to said roll, and means acting upon the return reach of the last said strip for progressively applying it flatwise and longitudinally to the first strip at a part of the latter supported by said roll.

In witness whereof I have hereunto set my hand this 20th day of October, 1919.

URBAN HAREN.