

May 6, 1930.

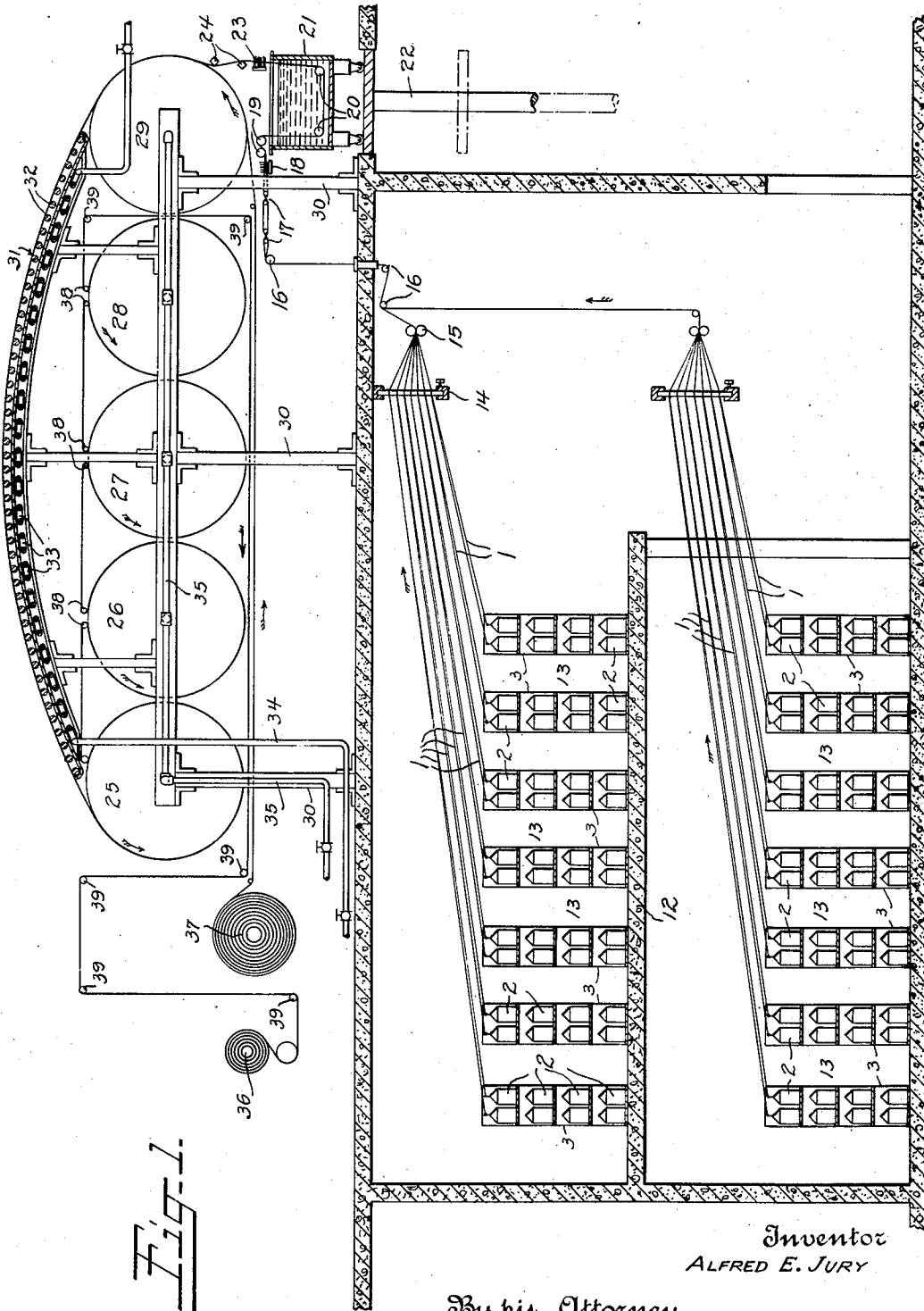
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1,757,636

METHOD AND APPARATUS FOR MAKING WEFTLESS FABRICS

Filed Dec. 15, 1922

3 Sheets-Sheet 1



By his Attorney
Ernest Hoffman

May 6, 1930.

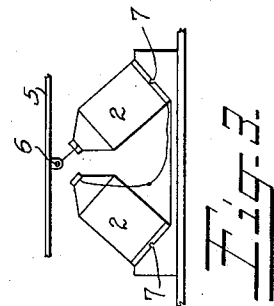
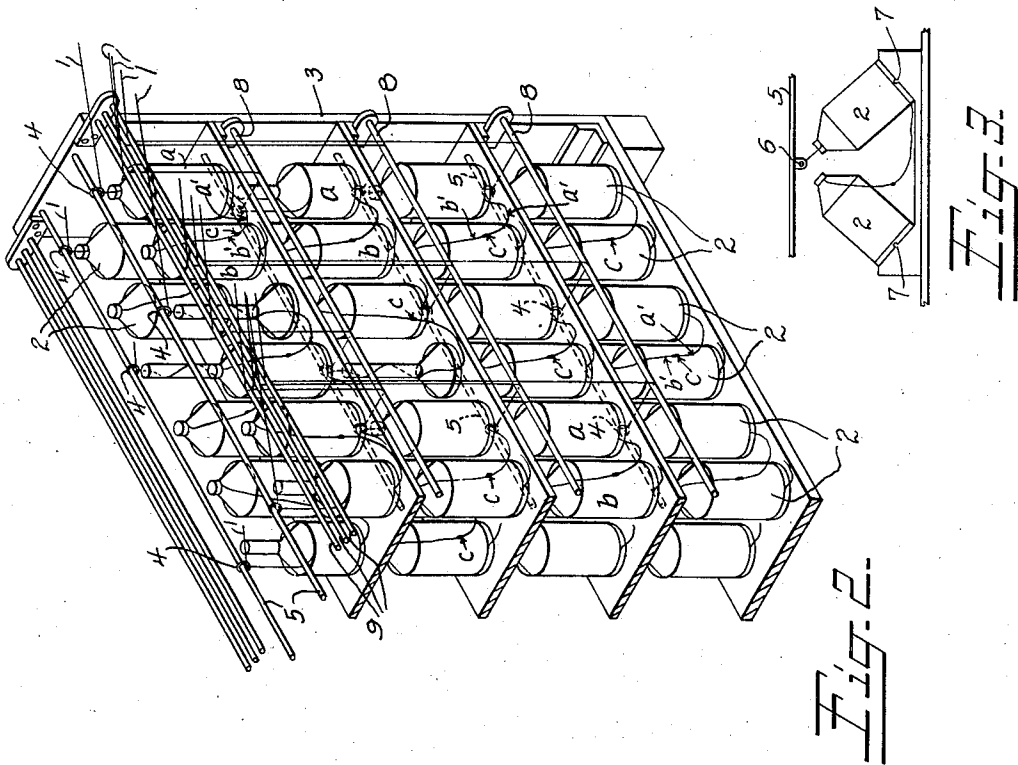
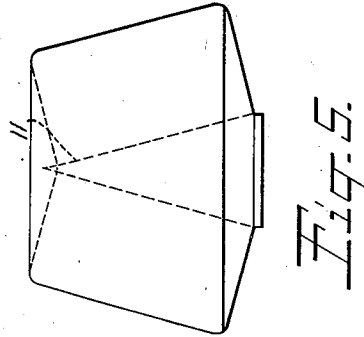
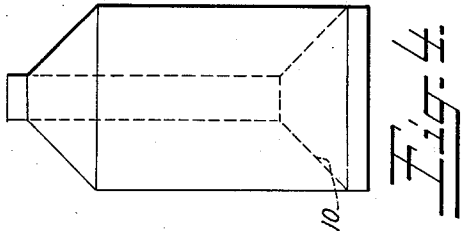
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METHOD AND APPARATUS FOR MAKING WEFTLESS FABRICS

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METHOD AND APPARATUS FOR MAKING WEFTLESS FABRICS

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3 Sheets-Sheet 3

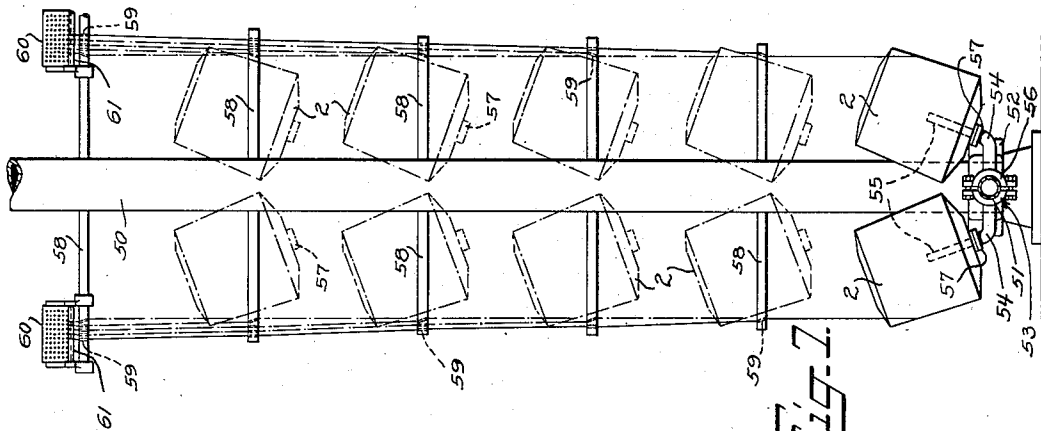


Fig. 7.

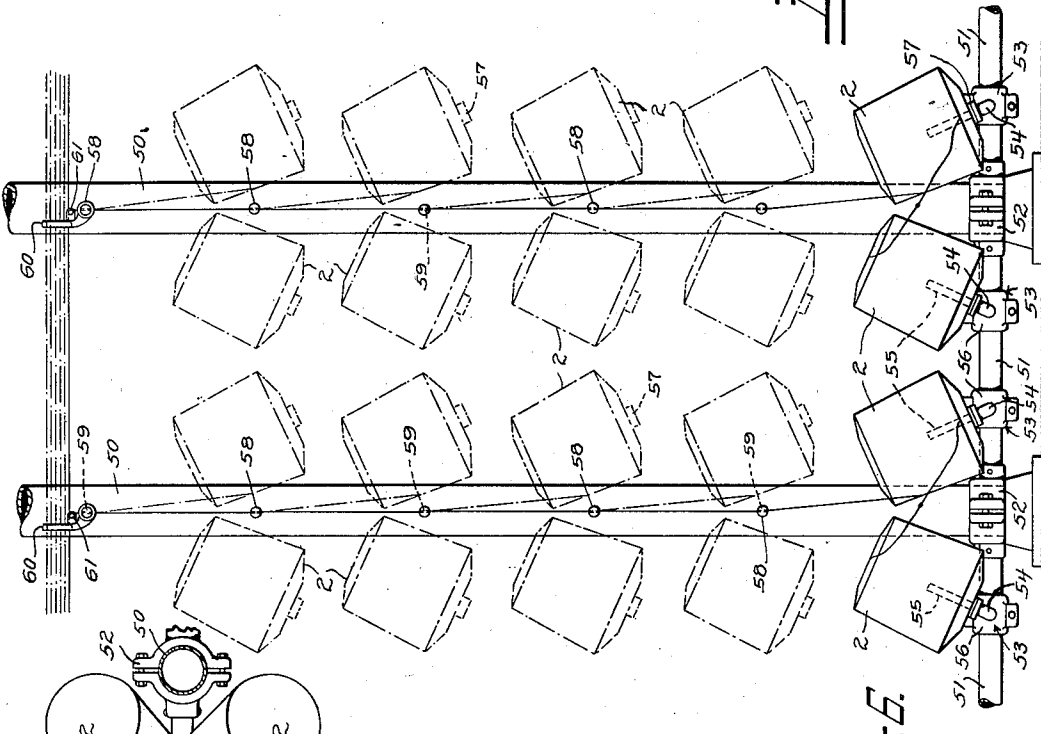


Fig. 8.

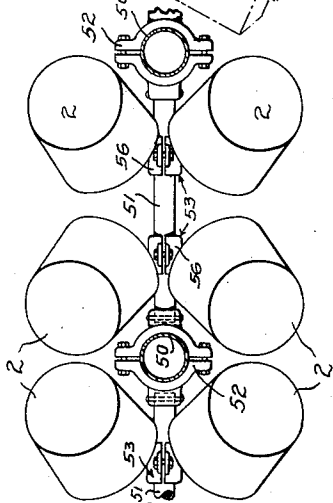


Fig. 9.

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METHOD AND APPARATUS FOR MAKING WEFTLESS FABRICS

Application filed December 15, 1922. Serial No. 607,021.

This invention relates to an apparatus for manufacturing weftless fabric, i. e., a sheet of cords, or other warplike elements, bound together by films or intervening webs of such a flexible substance as rubber or rubber composition, rather than by transversely extending filling threads, and suitable for incorporation in tires, tubes, hose and other articles, or rubber goods.

Generally, it aims to improve upon a prior apparatus, subject matter of a pending application now Patent No. 1,462,858, granted July 24th, 1923. More specifically, it aims to provide a construction and organization of parts capable of producing weftless fabric more rapidly. It further aims to provide a machine or apparatus in which masses of warplike elements, or cords, may be replenished and connected to other masses being drawn on without necessarily halting the operation of the machine. Still further, it aims to provide a combination and arrangement of parts designed to initially dry or preliminarily set the warplike elements, or cords, in contiguous parallel relation, and while more nearly flat than in the previous machine.

With the illustrated embodiment in mind and without intention to limit more than is required by the prior art, the invention may be briefly described as comprising replenishable masses of cord constituting sources of supply, the cords from which are conducted through a bath of latex and thence onto a pliable carrier which, with the coated sheet formation of cords thereon, is conducted over a slightly arched smoothing and drying device, and around a series of drying cans, the carrier being interposed between the treated sheet of cords and the heated metallic surfaces. Means are provided for conducting the pliable carrier beneath the sheet of cords immediately after they are treated and for coiling up the weftless fabric as fast as it is finished, the carrier strip being interposed between convolutions on the windup reel and serving to function also as a liner, if desired.

A preferred embodiment of the invention is illustrated in the accompanying drawings in which:—

Fig. 1 is a diagrammatic elevation, partly in section, of the preferred form of the apparatus;

Fig. 2 is a perspective of a replenishable spool or cord-mass holding rack;

Fig. 3 illustrates a desirable tilted arrangement of a pair of cord-windings or spools;

Figs. 4 and 5 illustrate two different and suitable windings of cord supply;

And Figs. 6, 7 and 8 illustrate in side, end and plan views, respectively, and diagrammatically, a commercial form of rack, or creel, for supporting the masses of cord supply.

To provide for the uninterrupted delivery of cords 1 to the fabric being made, the supply masses, or windings, 2 thereof, which are preferably at least twice as many in number as there are cords in the fabric, are desirably grouped in pairs (or higher multiples) on racks 3. While, for instance, one cord is being drawn off from one mass of a pair, *a*, *b*, Fig. 2, its ending end *a'* may be tied, spliced, or otherwise connected, as indicated at *c*, to the beginning end *b'* of the other mass *b* of the pair. Consequently, when one cord mass is exhausted, a second mass, which has previously been connected thereto, is ready for supplying the cord without necessarily halting the operation of the machine. And while this second mass is being drawn on, another cord mass may be taken from stock and positioned in place of the first, or exhausted, mass. In this way, one or more operatives attending the machine may maintain a source of supply for each cord and, if desirable, carefully splice their beginning and ending ends so as to free the product from knots.

It is desirable to draw off the cord from a point in axial alignment with the masses, or windings, 2. To accomplish this from either of a pair of windings, or supply masses, the lead-off is conducted either through travelers 4 slidable on rods 5, as illustrated in Fig. 2, or through eyes 6 fixed at the intersection of the axes of tilted windings, as illustrated in Fig. 3. In this latter case, if the center of gravity of the tilted masses necessitates, any suitable means, such as the slot and projection 7, may be provided to hold the

windings in position. In the former case, the travellers 4 are, of course, shifted automatically by the tension, or pull, on each cord.

If the masses, or windings, 2 are stacked on different shelves of a rack, it is advisable to guard against interference of one cord with another, at least when shiftable travellers 4 are employed, and to this end, such means as the rods 8, flanking each shelf, and spacing bars 9, at the tops of the racks, may be conveniently supported as, for instance, in the manner illustrated in Fig. 2 of the drawings.

The cord may be wound to form the masses 2 in any suitable manner and on an open-ended spool with a conical base, such as shown at 10 in Fig. 4, or on a discardable pasteboard cone, such as illustrated at 11 in Fig. 5. Of course, a wooden cone bored to receive a straight spindle may also be employed. I prefer, however, in all cases to employ a type of winding that may be drawn off from a point above its axis so that the masses may remain stationary when the machine is in operation. Therefore, various types of winding may be employed, advantageously, however, possessing free and available beginning and ending ends that permit operatives to splice, or otherwise unite, adjacent masses or spools.

The racks 3 holding the cord masses, or windings, 2 may, of course, be located in any convenient relation to the machine and grouped in any convenient manner. They may be located, as illustrated, in tiers below the machine, as, for instance, on a balcony 12, with provision for access in replenishing and splicing the spools afforded by aisles 13, or they may be located back of the machine, i. e., to the left of Fig. 1, when the apparatus is all to be assembled upon the same floor.

The cords may be conducted through any suitable means and in any convenient manner to a treating station. I preferably pass them through thread guiding and paralleling means, comprising adjustably supported apertured thread boards 14, presser rolls 15, guide rolls 16, lease rods 17, spacing comb 18, and guide rolls 19, which act to arrange the cords in contiguous relation in sheet formation.

The layer of parallel cords thus formed is then treated with latex having the desired rubber content and with or without admixed preserving, vulcanizing, or compounding ingredients. Application of the latex may be made in any way desired, but for making weftless fabric, I prefer to pass the cords around parallel guide rolls 20 suitably supported in a tank 21 maintained filled with latex in any convenient manner. Means are desirably provided for permitting the latex being withdrawn from out of contact with the cords in order to avoid non-uniform coating if, for any reason, the machine, or apparatus, is stopped. This may be done various-

ly, but most simply by providing an elevator 22 to raise and lower the tank.

The treated cords in sheet formation are conducted from the tank through a comb 23 and between scraper bars 24 for removing any excess of latex. The comb 23, positioned between the scraper bars 24 and the tank 21, insures proper spacing of each cord, or of every two, three, etc., cords, as conditions may require.

The latex-treated cords have then to be dried to unite them one to another and thereby to obtain the sought filamentary sheet material, or weftless fabric, in which parallel, and preferably contacting, cords are connected each to its neighbor by intervening films, or webs, of virgin rubber. For drying the latex, I prefer the apparatus illustrated in Fig. 1 of the drawings, which comprises a series of rather large drying cans 25, 26, 27, 28 and 29, suitably journaled in a frame 30 and each adapted to be rotated in the direction indicated by the arrows by any suitable means (not shown) at a suitable peripheral speed. It will be noticed that the drying cans 25 to 29 rotate in the same direction. Above this row of drying cans, which are preferably, but not necessarily, horizontal, I arrange a combined drying and smoothing device, indicated generally by the numeral 31, which preferably consists of a series of rollers 32 and heating coils 33, arranged in a flat arch formation, reaching from one end to the other of the row of drying cans. This combined smoothing and drying device is of less span than length, thus insuring the maintenance of more or less tension on material drawn thereover, thereby maintaining it nearly flat and free from wrinkles. Heat may be supplied to the cans and device 31, in any desired way, most simply, as shown, by suitably connected lines of valve-controlled pipes 34 and 35, through which steam at any desired pressure, for instance, may be passed.

At one side of the apparatus, as shown, a wind-up reel 36 may be located for removing the dried weftless fabric from the machine as fast as it is finished. And adjacent the wind-up reel, or wherever it is convenient, I preferably mount a coil 37 of flexible material, such as liner fabric, which is conducted through the machine so as always to intervene between the latex-treated sheet of cords and the heated metallic surfaces which constitute the several drying devices. As clearly illustrated in the drawings, the material 37, which constitutes a flexible carrier, meets the end drying can 29 in advance of the latex-treated sheet of cords. The flexible carrier 37 and sheet of cords then move together as a unit over the combined smoothing and drying arch 31, and for a short distance around the drying can 29, to the receiving end one, 25, of the series of drying cans. About these, the material is conducted, preferably as shown,

by locating idle rolls 38 in pairs and relatively close together at the tops of the drying cans so that substantially all of their large peripheral surface is utilized to conduct heat through the flexible carrier or material 37 to the latex-treated cords, which latter are thus kept out of contact with the heated metallic surfaces and prevented from gumming the same. The idle rolls 38 may be, and desirably are, water cooled. And if desired, an air blast may be directed in one or more of the bights of the material as it passes around the idle rolls 38. By the time the latex-treated cords have passed over the arch 31 and around the drying can 25, they are sufficiently dried and set in their proper relative positions to pass around the first of the idle rolls 38 without gumming it and without injuring the bond between the rubber and the cords. The flexible carrier and weftless fabric leaving the can 28 are conducted around guide rolls 39 to wind-up reel 36. For convenience in the subsequent handling of the weftless fabric, it is desirable to coil a liner strip between the convolutions thereof which otherwise are likely to adhere. And for this reason, I prefer to utilize the flexible carrier 37 also as a liner and, therefore, to coil it up with the weftless fabric in the wind-up reel 36.

In Figs. 6 to 8 of the drawings is illustrated a form of rack, or spool support, generally known as a creel, especially valuable and practical for use in a factory. Its framework comprises any suitable number of vertical columns, or standards, 50, secured and braced in alignment by tie-rods 51. While the tie-rods may be variously secured to the columns, I preferably support their ends in split collars 52, thereby providing for vertical adjustment of the tie-rod. On the tie-rods are supported brackets 53, such consisting of arms 54 with bent ends 55 and a split collar 56, this latter permitting leveling, as well as bodily adjustment, of the bracket. The bent end 55 of each arm is adapted to enter the bore in the cone or core on which the cord is wound, a disk 57 being mounted on the end of each bracket to properly support each mass 2 of cord.

At intervals on the standards 50, and at right angles to the tie-rods 51, are cross-arms 58, provided at their free ends with one or more guiding apertures 59, each arm having one more aperture than there are cross-arms below it, and these being suitably located so as to avoid interference of one cord with another. Suitably supported at the top of the framework are a number of threadboards 60 and guide-rolls 61. The several threadboards, of course, are located in registering alignment lengthwise of the framework, or creel.

Two brackets 53 are preferably located on each tie-rod 51 with their bent ends inclined in two directions, as apparent from plan view Fig. 8. Thus, the cord windings 2 may be

grouped in pairs, on each side of the framework or creel, with their axes intersecting approximately in the guiding-aperture 59 in the cross-arm 58 above. Each pair of cord windings 2 is also arranged with its axes inclined outwardly so that the guiding aperture 59 in the cross-arm 58 may be located far enough away from the vertical plane of the framework to clear the space occupied by the many cord windings 2, in the passage of the cord from the source of supply to its threadboard 60 above the creel.

The operation of the machine will be obvious from what has already been stated in the detailed description thereof. Owing largely to the comparatively great length of the material between the tank 21 and the first idle roll 38, engaged by the treated face of the cords, which length of material is subjected to heat treatment, the apparatus of the present invention enables weftless fabric to be produced with greater speed than heretofore. The construction and arrangement of the parts require but comparatively few drying cans and these may be mounted in a horizontal, rather than a vertical, frame, thereby affording greater ease in construction and access in repair or attendance. Of especial value is the feature of the cord supply which permits of access to any of them for replenishment of exhausted masses and splicing of one spool being drawn on to another spool in reserve. Very large windings may be employed with facility. No expensive or complicated parts are required to support the masses, or windings, of cord to permit rotation thereof, as these may be, and preferably are, stationary when the cord is withdrawn axially therefrom.

The specific form of the apparatus disclosed may, of course, be varied. While a horizontal disposition of the drying devices is preferred, it is obvious that they may be stood on end, that is, arranged generally vertically, and some of the advantages of the invention realized. It is to be understood also that the threads or cords may be of any suitable size and spaced any desired distance between their centers. While the machine or apparatus is intended primarily for manufacturing "weftless fabric," i. e., a sheet of generally parallel cords joined together solely by webs of rubber, or rubber composition, it may also be used for treating so-called "cord fabric" having widely spaced filling threads, and in fact, any form or arrangement of cords that may be advantageously treated with latex and dried. In the claims, the term "cord" is used in a comprehensive sense and is intended to include thread, or any other form of strain-resisting-element for reinforcing or strengthening rubber articles.

The features of tying the beginning and ending ends of supply masses of cord so that the supply thereof may be continued uninter-

ruptedly, is not limited to the specific and preferred form of apparatus illustrated. This feature may be used with advantage in supplying cords to calenders and uniting the cords together with films or skim-coats of rubber. And the invention both in the method and apparatus is to be understood as comprehending such use of the creel or spool-supports disclosed. In short, all uses of this feature of the invention are intended to be comprehended in the claims.

Therefore, it is to be understood that the invention is not intended to be limited to the precise disclosure and comprehends changes and alterations within the principles of the construction disclosed. Therefore, reference should be made to the accompanying claims for an understanding of the scope of the invention.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. An apparatus for manufacturing weftless fabric, comprising in combination, means for supplying a plurality of cards, means for applying latex to the cords, means intermediate the first two mentioned means for guiding and paralleling the cords, means for continuously removing the treated cords from said applying means and drying them to form a sheet including a series of heated metallic surfaces together forming an arch over which the cords are drawn under tension and a pliable fabric carrier interposed between said series of heated metallic surfaces and the treated cords.

2. An apparatus for manufacturing weftless fabric, including in combination, drying cans, a series of which are rotatable in the same direction, a tank for a rubber-containing liquid, means for guiding the cords to the tank and passing them therethrough in contiguous relation, means for carrying treated cords from the tank around the series of drying cans, and a drying device interposed between said tank and said cans and forming a flat arch over which the cords are drawn under tension while initially drying the rubber-containing liquid in situ thereon.

3. An apparatus for manufacturing weftless fabric, comprising in combination, sources of cord supply, means for applying a rubber-containing liquid to the cords, means for guiding and arranging the cords parallel in sheet formation, means for drying the treated sheet of cords including a flexible carrier for directly engaging the sheet of treated cords, a series of drying cans, and preliminary drying and smoothing means in the form of a fixed arch intermediate one of said cans and the remainder of the series thereof over which the cords are drawn under tension to initially set the treated cords in sheet formation and while substantially flat.

4. An apparatus for manufacturing weft-

less fabric, including in combination, means for guiding cords and assembling them parallel in sheet formation, means for applying latex to the cords, a flexible carrier for conducting the cords from said applying means, means for drying the latex on the cords on said carrier to maintain them in sheet formation, said last named means including a series of heated metallic devices arranged in arch formation and contacting only with the flexible carrier, and means for removing the carrier and weftless fabric dried thereon from the machine.

5. An apparatus for manufacturing weftless fabric, including in combination, drying cans, a series of which are rotatable in the same direction, a tank for a rubber containing liquid, means for guiding the cords to the tanks and passing them therethrough in contiguous relation, means for carrying treated cords from the tank around said series of drying cans, and a drying device adjacent said carrying means including a substantially fixed arch, the fabric being drawn under tension over the convex face of said arch by said carrying means.

6. An apparatus for manufacturing weftless fabric, including in combination, drying cans, a series of which are rotatable in the same direction, a tank for a rubber containing liquid, means for guiding the cords to the tanks and passing them therethrough in contiguous relation, means for carrying treated cords from the tank around said series of drying cans, a drying device adjacent said carrying means including a substantially fixed arch, the fabric on said carrying means being drawn under tension over the convex face of said arch, and means for applying heat to the fabric while passing over said arch.

7. An apparatus for manufacturing weftless fabric, including in combination, drying cans, a series of which are rotatable in the same direction, a tank for a rubber containing liquid, means for guiding the cords to the tanks and passing them therethrough in contiguous relation, means for carrying treated cords from the tank around said series of drying cans, and a drying device adjacent said carrying means including a series of parallel and contiguous idler rollers arranged to form a substantially flat arch, the fabric on said carrying means being drawn over the convex face of said arch under tension.

Signed at New York city, New York county, New York State, this 24 day of November, 1922.

ALFRED E. JURY.