H. J. DOUGHTY.

FRICTION CALENDER FOR TIRE FABRIC.

APPLICATION FILED DEC. 30, 1912.

1,077,126.

Patented Oct. 28, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

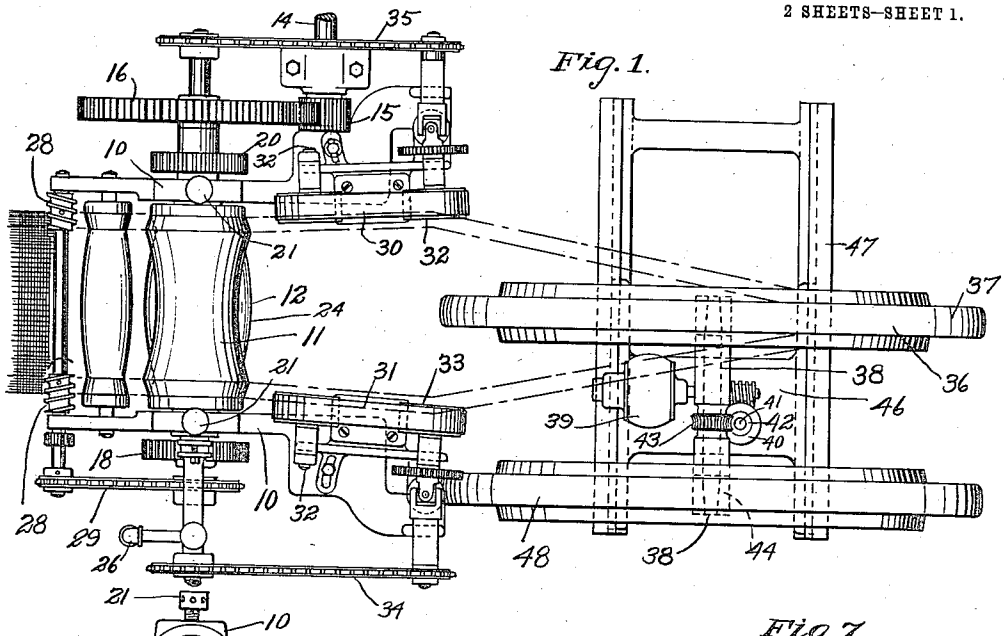


Fig. 7.

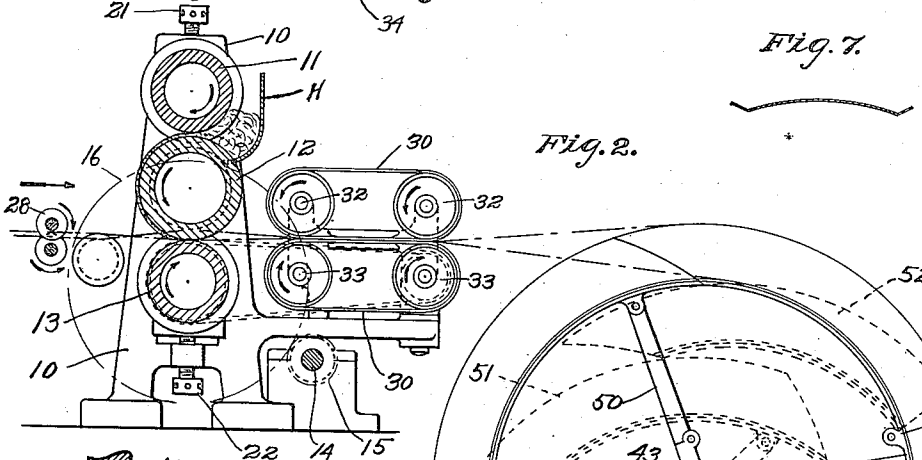
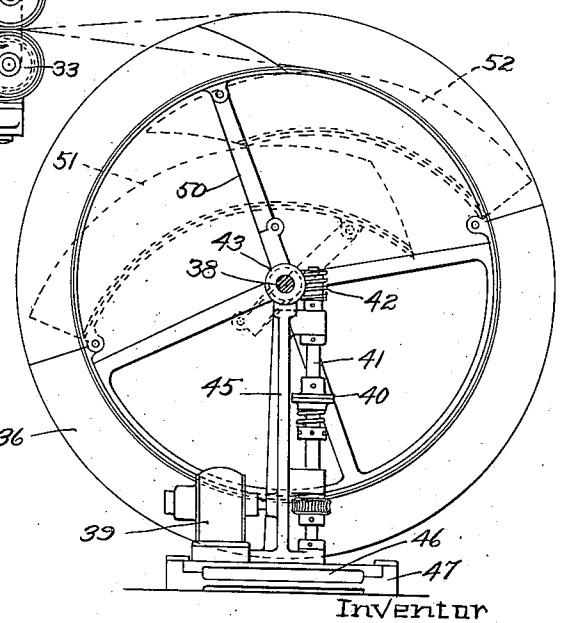


Fig. 2.



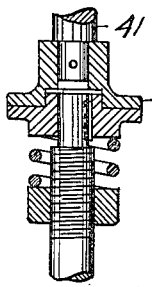


Fig. 3.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 4.

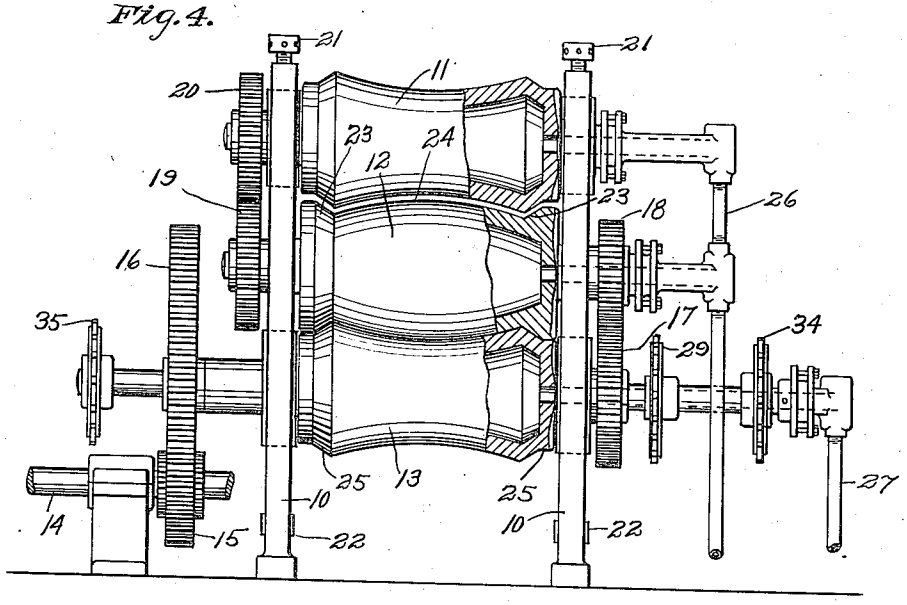


Fig. 6.

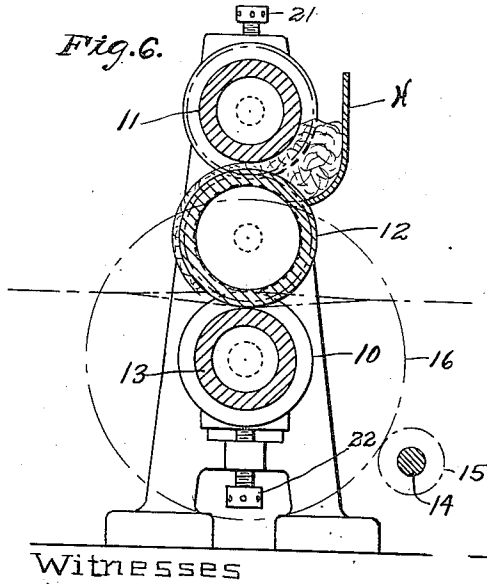
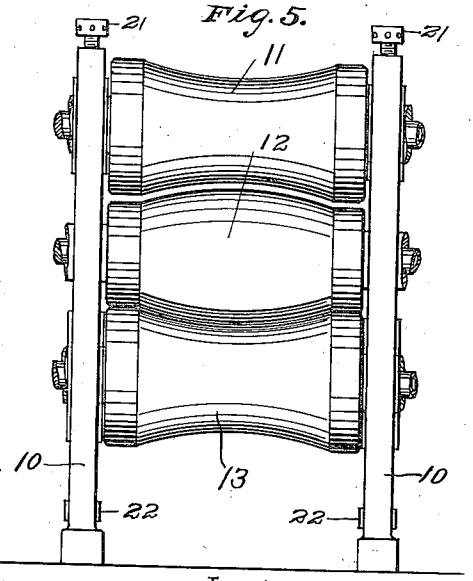


Fig. 5.



Witnesses

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FRICTION-CALENDER FOR TIRE FABRIC.

1,077,126. Specification of Letters Patent. Patented Oct. 28, 1913.

Application filed December 30, 1912. Serial No. 739,232.

To all whom it may concern:

Be it known that I, HENRY J. DOUGHTY, a citizen of the United States, and resident of Edgewood, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Friction-Calenders for Tire Fabric, of which the following is a specification.

This invention relates to machine for coating fabric with rubber, or other material, and has for its object to provide a machine that is adapted to calender a strip of fabric whose natural woven form is concavo-convex in cross section, and to provide this machine with a friction roll that is convex in longitudinal section, and to also provide the complemental rolls of the calender of a corresponding concave shape to coöperate with the friction roll for the purpose of receiving and acting upon the fabric of the corresponding shape, and applying the coating of rubber uniformly to all of the different portions of its surface while said different portions are traveling at relatively different speeds through the calendering machine.

A further object of my invention is to provide means for stretching the fabric transversely, both before and after passing it through the calendering rolls.

A further object of the invention is to provide a forming reel coöperating with the calender for receiving and shaping the coated fabric while warm and in a plastic condition and to wind the same spirally into superimposed layers to form the tire casing from one continuous strip of fabric.

A still further object of the invention is to provide simple and effective means whereby when the desired number of layers of fabric have been wound upon the form, the strip may be severed and the form withdrawn and another immediately positioned to take its place to receive the strip without interfering with the continuous action of the calender.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described and particularly pointed out in the appended claims.

Of the accompanying drawings: Figure 1— is a plan view showing my combination fabric coating machine and rotatable form on which the fabric after having been coated is wound in a plurality of superimposed layers. Fig. 2— is a central sectional side elevation of the mechanism illustrated in Fig. 1. Fig. 3— is a rotatable sectional elevation showing the frictional plates through which the form reel receives its rotary motion. Fig. 4— is a front elevation of the fabric coating machine. Fig. 5— is a front elevation of a coating machine showing a set of calender rolls with convex and concave surfaces, but having their ends formed straight instead of curved like those shown in Fig. 4. Fig. 6— is a central sectional elevation of the construction shown in Fig. 5. Fig. 7— is a detail showing the concavo-convex form of the fabric in cross section such as my improved machine is designed to operate upon.

My improved calendering machine is one of a series of machines employed in the manufacture of casings for vehicle tires, and is designed to apply a coating of rubber or similar plastic or other material to the surface of the fabric as it passes therethrough. The fabric to be acted upon in this machine is not of the usual plain flat shape, but is preferably woven to naturally take the shape of the tire casing both circularly around its periphery and circularly around the tire in transverse section whereby the warp threads of the middle of the fabric are longer and graduate in length toward the edges thereof therefore being naturally of a concavo-convex shape in cross section, as illustrated in Fig. 7. This fabric is also of a particularly open weave especially on its tread portion so that the coating of rubber applied thereto may be forced through these open meshes to the opposite side so completely that the fabric requires a coating applied to but one side only. To operate on a fabric of this particular shape and construction requires a coating machine of special construction.

Referring to the drawings, 10 designates the upper side frames of this specially constructed fabric coating machine in which are adjustably mounted the calender rolls 11, 12 and 13. These rolls may be driven in any desired manner and from any convenient source of power, but I have shown the roll 13 as driven from the shaft 14 through the pinion 15 and large gear 16, and this roll in turn as driving the friction roll 12 through the gears 17 and 18, the latter roll being driven somewhat faster than the other rolls for the purpose of depositing pressing and ironing the material onto and into the fabric

as it passes therebetween, and the upper or controlling roll as being driven through the gears 19 and 20. The rolls 11 and 12 are each preferably mounted in vertically slidable journal boxes of any usual or preferred construction and are adapted to be adjusted either toward or from the middle calender roll by means of the set of screws 21 and 22 respectively. The adjustment of the upper roll is for the purpose of regulating the thickness of the coating to be applied to the fabric while the adjustment of the lower roll is for the purpose of regulating the pressure by which the coating is inserted into the pores or meshes of the fabric. A holder H is arranged to feed the coating material between rollers 11 and 12 as illustrated in Figs. 2 and 6.

An essential feature of my improved machine is the form of construction of the calendering rolls. The contour in cross section of the middle or friction roll 12 is similar to that of the fabric in cross section, that is, the roll is convex in its middle transverse section with outwardly flaring end flanges 23 the middle portion 24 of the roll being shaped to accommodate the tread portion of the tire fabric while the beveled or flaring flanges 23 are to receive and accommodate and act upon the edges or flap portions of the fabric which are to be folded back upon the sides of the casing after the wire or stiffening member has been applied thereto. The complemental rolls 11 and 13 are necessarily formed in a corresponding convex shape with oppositely shaped end flanges 25 so as to coöperate with the flaring flanges of the center friction roll. One of the reasons for forming this friction roll 12 with a convex surface is, so as to cause the fabric to take its natural shape while being coated. Another reason for this shape of friction roll is that its middle portion, which is the largest, will naturally travel the fastest which speed is in proportion and corresponds to the length of the corresponding portions of the fabric, in other words, the middle threads of the tread portion of the fabric are longer than those at the edge and consequently must travel proportionately faster which speed is controlled or taken care of by the convex shape of the roll. I herein broadly refer to the fabric as of arched form in cross section, and to the friction roll as of varying diameter corresponding to the cross sectional form of the said fabric.

Another advantage is secured by forming the roll 12 of convex shape and driving it faster than the roll 13. For instance, it is well known that the rubber coating will follow the faster of two rolls. Therefore, a greater quantity of rubber will be applied to the fabric at the middle point of the convex roll 12 than at the ends thereof. The particular fabric that I prefer to treat is more loosely woven and thicker at the middle than at the edges and consequently the rubber must be fed more rapidly at the middle than at the edges. It is also desirable to make the rubber coating thicker at the middle than at the edges. Both of these functions are accomplished by forming the friction roll as illustrated and driving it faster than the pressure roll. I do not limit myself to the application of more plastic material, per unit of area, at the middle or arched portion of the fabric than at the sides thereof, as this may or may not be done, within the scope of the invention. Because the middle portion of the tire or fabric is arched or curved rather than flat, the said middle portion, being of greater area, receives more plastic material. These rolls may be heated to any desired temperature by steam applied through pipes 26 and 27 by any other suitable means.

In order that the fabric may be held out in its natural shape and stretched somewhat before it enters the calendar rolls, I have provided rotary worm-shaped stretching rolls 28 which act upon its marginal edges to stretch the weft threads laterally. These stretchers are shown as being actuated from one of the roll shafts through the sprocket chain 29.

After the fabric has passed through the calender rolls and been coated, it is found to be of great importance to engage and stretch the same laterally until practically all of the stretch has been removed from the weft threads, which is accomplished by means of the two pairs of friction belts 30 and 31 which run over the sets of pulleys 32 and 33, respectively the latter set being driven through the medium of sprocket chains 34 and 35 from one of the roll shafts. The surface of these tension applying belts may be supplied with any suitable means, such as pins or other suitable means, for firmly engaging the edges of the fabric, and they are set on diverging angles so as to pull and stretch the fabric laterally to its fullest extent. I do not wish to be limited to the lateral stretching means shown and described, as any other suitable means may be employed for this purpose without departing from the spirit and scope of my invention.

In order to shape this fabric while its coating is still in a warm or plastic state, I have provided a forming reel or wheel 36 whose periphery 37 is substantially the size and shape of the inner walls of the finished casing. This former is shown as being mounted on one end of the shaft 38 and a similar or duplicate former 48 is mounted on the opposite end of said shaft. This shaft is mounted in bearings 44 supported on standards 45, which are carried on a plate 46 to slide longitudinally in guides 47 and the said shaft with its two formers is shown

as being driven by an electric motor 39 through the friction plate 40, shaft 41, worm 42, and worm wheel 43 so as to apply a light circular pull on the fabric as it is wound on the former, but I do not wish to be restricted to any particular means for rotating this former as any suitable driving means may be employed. After the desired number of layers of fabric have been wound one upon the other on the former the strip is severed and the carriage portion 46 is slid longitudinally across to remove this former 36 with its shaped casing and to simultaneously position the duplicate former 48 to continue to receive the fabric as it is being continuously produced from the calender and that without stopping the operation of the calender. The former is now readily removed from the central shaft and another former slipped into position thereon ready to be moved back into position to receive another winding of the fabric when the second casing has been completed on the other former 48, and so on this action is repeated first one former and then another is employed for receiving and shaping the layers of fabric into the form of a casing. The forming wheels as removed may be placed on another mounting for the purpose of receiving the outer or tread portion of rubber which is applied thereto, after which the wheel is collapsed by bending the spoke 50 back into the dotted position illustrated in Fig. 2 and swinging inward the two hinge rim sections 51 and 52 thereby permitting the casing formed thereon to be readily removed to be subsequently acted upon in a molding press. The rim sections of this former are then replaced and the wheel is in readiness to be again mounted on the shaft 38 and slid into position to have the fabric again wound thereon.

I have described the friction roll as having an oval or convex working surface, but I do not desire to be restricted to the use of this particular form of roll as a roll having any irregular shaped face with a plurality of different diameters along its working face will fall within the spirit and scope of my invention. By "irregular shape" I mean a roll constructed out of the usual form, that is, not of the plain cylindrical shape universally used in the ordinary calendering machine.

I claim:

1. A machine for coating a concavo-convex fabric comprising a friction roll shaped to have a greater peripheral speed at the middle than at the ends, a pressure roll complemental thereto, and a feed roll coöperating with said friction roll, and to which plastic material may be supplied, whereby a greater quantity of said plastic material is applied to the middle of the fabric than to the edges.

2. A machine for coating a concavo-convex fabric comprising a friction roll shaped to have a greater peripheral speed at the middle than at the ends, a pressure roll complemental thereto, a feed roll coöperating with said friction roll, means for holding a mass of plastic material at the feeding point, whereby a greater quantity of said plastic material is applied to the middle of the fabric than to the edges and means engaging the edges only of the fabric for stretching the same laterally as it is delivered from said friction and pressure rolls.

3. A machine for coating a concavo-convex fabric comprising a friction roll shaped to have a greater peripheral speed at the middle than at the ends, a pressure roll complemental thereto, a feed roll coöperating with said friction roll, and to which plastic material may be supplied, whereby a greater quantity of said plastic material is applied to the middle of the fabric than to the edges, and means for stretching the fabric before subjecting the same to the action of said friction and pressure rolls, and means for stretching the fabric as it leaves said rolls.

4. A machine for coating a concavo-convex fabric comprising a friction roll shaped to have a greater peripheral speed at the middle than at the ends, a pressure roll complemental thereto, a feed roll coöperating with said friction roll, and to which plastic material may be supplied, whereby a greater quantity of said plastic material is applied to the middle of the fabric than to the edges, and diverging friction belts engaging the fabric as it is delivered by said rolls.

5. A machine for coating a fabric of arched form in cross-section, comprising a friction roll of varying diameter corresponding to the cross-sectional form of the said fabric, a pressure roll complemental to said friction roll and a feed roll coöperating with said friction roll and to which plastic coating material may be supplied, whereby more plastic material is applied to the arched portion of the fabric than to the edges.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY J. DOUGHTY.

Witnesses:

HOWARD E. BARLOW,

E. I. OGDEN.