April 6, 1926. 1,579,293

A. E. FALOR

METHOD AND APPARATUS FOR MAKING ENDLESS BELTS

Filed August 4, 1921

Fig. 1.

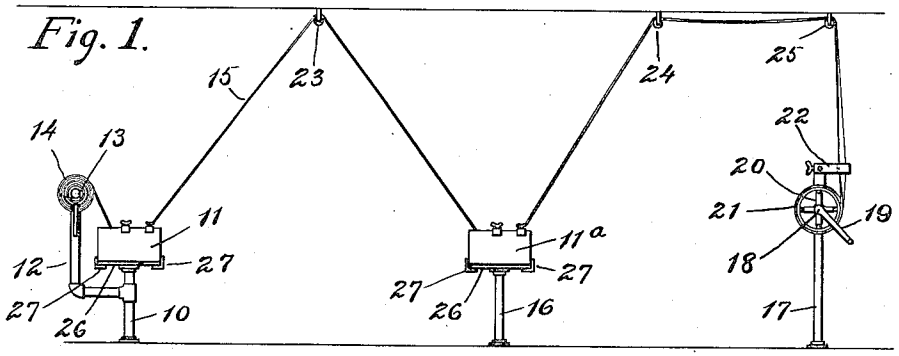


Fig. 2.

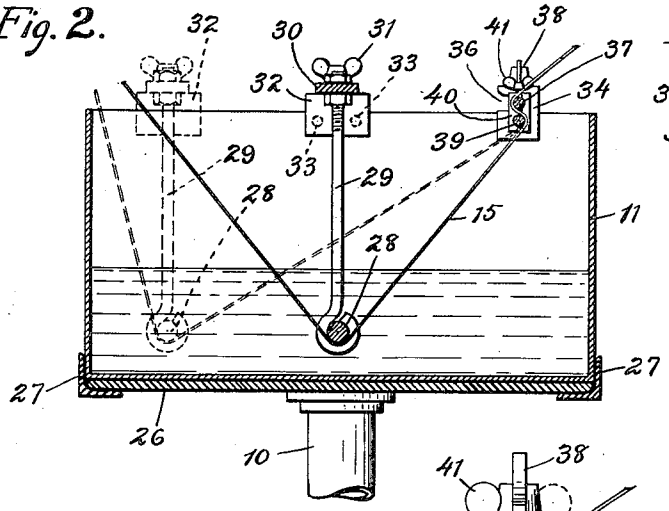


Fig. 3.

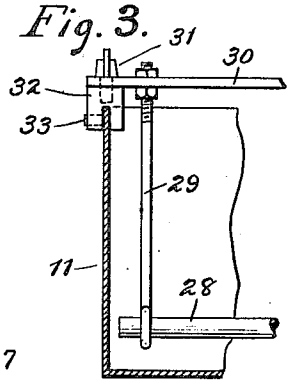


Fig. 4.

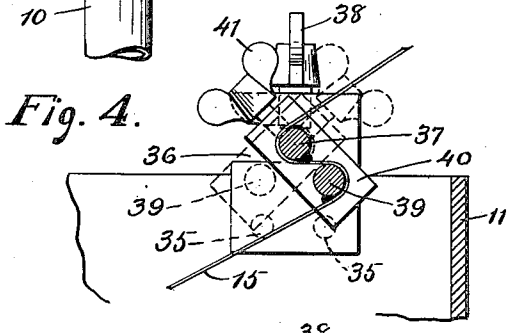
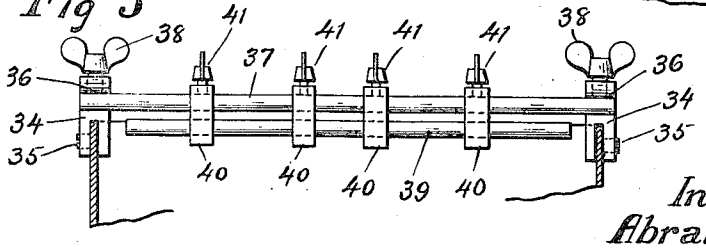


Fig 5



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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR MAKING ENDLESS BELTS.

Application filed August 4, 1921. Serial No. 489,875.

To all whom it may concern:

Be it known that I, ABRAM E. FALOR, 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 Making Endless Belts, of which the following is a specification.

This invention relates to means for making endless laminated belts and its object is to provide a more rapid and economical method than the ones in general use and also to provide improved apparatus for this purpose, including suitable devices for coating the strip of belt-making fabric with an adhesive liquid such as rubber cement, removing the excess cement, and regulating the thickness of the coating or coatings and the degree of tension on the strip.

Of the accompanying drawings, Fig. 1 is a side elevation showing a strip-coating and belt-making apparatus constructed and arranged according to my invention and adapted to carry out my improved method.

Fig. 2 is a longitudinal, vertical section of one of the coating tanks.

Fig. 3 is a transverse section of a portion of the tank showing the belt immersing guide.

Fig. 4 is an enlarged longitudinal section at the delivery end of the tank, illustrating the construction and mode of adjustment of the wiping devices.

Fig. 5 is a transverse section of the upper part of the tank, showing the wiping devices.

In the drawings, 10 is a standard supporting the first one of the rubber cement tanks 11, and having an arm 12 with a horizontal shaft 13 for rotatably supporting the roll 14 of belt-making material in the form of a strip 15. This strip may, for example, consist of selvedge-edged webbing or other woven fabric. 16 is another standard supporting a second cement tank 11ª, similar to the first, for applying a second coating of cement. It will be understood that the tanks may be greater or less in number according to the desired number of coats to be applied, and I prefer to use a relatively thin rubber solution in the first tank in order thoroughly to impregnate the threads of the fabric strip 15, the solution in the next tank being of thicker consistency and so on according to the number of tanks.

At 17 is a third standard at the upper end of which is a rotary shaft 18 having a crank 19 for turning it and a chuck 20 upon which is mounted a drum 21 for winding up the adhesive coated strip in successive convolutions upon itself to form it into a belt and for furnishing the propelling power whereby the strip is drawn from the roll 14 through the tanks and over the several strip guides. The coated strip is laid onto the drum 21, through a guide 22, which imparts thereto a partial twist in order that one edge shall be laid slightly before the other and the laying accomplished evenly.

Suspended from the ceiling of the room are a series of guide pulleys 23, 24, 25 for causing the coated strip to traverse an elongated path on leaving the coating tanks in order to expose it to the air and cause the solvent to be evaporated to a greater or less extent. This evaporation could, of course, be accelerated by the use of any suitable artificial drying means, if desired.

The tanks may be detachably secured to their standards by a tongue-and-groove connection formed by the edges of a plate 26 fixed to the upper end of the standard and a pair of angle-irons 27 fixed to the opposite lower edges of the tank, as indicated in Figs. 1 and 2.

Each of the tanks has a strip-immersing guide consisting of a transverse rod 28 in its lower portion suspended by a pair of vertical rods 29, whose upper ends are secured to a cross-bar 30 spanning the tank, this cross-bar having its ends detachably connected by thumb screws 31 to a pair of forked brackets 32 embracing the upper edges of the opposite longitudinal side walls of the tank and each secured thereto by a pair of set-screws 33. On manipulating these screws, the brackets may be shifted longitudinally of the tank to adjust the horizontal position of the strip-immersing guide 28 therein for a purpose to be described.

34, 34 are a pair of brackets secured by set-screws 35 to the upper edges of the longitudinal side walls of the tank at the delivery end thereof, these brackets being formed with open-ended slots 36 to receive the ends of a wiper-rod 37 fixed therein by a pair of thumb-screws 38. 39 is a second wiper-rod located in fairly close proximity to the rod 38 in a position parallel to and below the latter, and supported therefrom by a series of arms or blocks 40 which are apertured

to receive the two rods and are slidably adjustable therealong and adapted to be fixed in different positions to the top rod 37 by means of thumb-screws 41, these blocks including between them a plurality (three in this instance) of strip-receiving spaces, the width of which may be varied by adjusting the blocks longitudinally of the rods. The blocks serve to act as edge-wipers for removing the excess of cement from the edges of the strips as the latter are passed between the blocks.

By manipulating the thumb-screws 41 and turning the blocks 40 pivotally upon the upper rod 37, or by loosening the screws 38 and turning the upper rod, the lower rod 39 may be swung around said upper rod so that a line connecting the axes of the rods will occupy different angular positions with reference to the path of the strip 15 in passing upwardly to the anterior rod 39 from the strip-immersing guide 28 and onwardly out of the tank, two positions of the rod 39 being shown respectively in full and dotted lines in Fig. 4 and a third position in full lines in Fig. 2.

In the operation of this apparatus, the leading end of the rubberized fabric strip 15 is stuck to the surface of the drum 21 and the crank 19 is turned in order to rotate said drum and draw the strip from off the roll 14, through the successive tanks 11, 11ª and over the guide-pulleys 23, 24, 25 on the ceiling. In each tank the strip passes down under the guide-rod 28 immersed in the rubber solution, and then upwardly to the wiper-rods 39 and 37, around and between which it passes in reverse bends of greater or less depth according to the angular adjustment of the arms 40, carrying the lower rod 39. The effect of these wiper-rods is to scrape off the excess cement from both sides of the strip and press the portion remaining on the strip frictionally against the latter so as to secure good penetration or adhesion of the coatings while at the same time the excess is being scraped from the two edges of the strip by the action of the arms 40 which are adjusted close to said edges. The angular adjustment of the arms 40 around the upper wiping-rod 37 affects the thickness of the coatings allowed to remain on the surface of the strip 15, the greater angle shown in full lines in Fig. 4 producing a greater tension on the strip and a longer arc of contact with the rods 37 and 39, with the result of a relatively thinner coating on both sides as compared with the adjustment shown in Fig. 2, for example, or that shown in dotted lines in Fig. 4. The thickness on the upper side of the strip may be independently varied by shifting the horizontal position of the rod 28 in the tank. The dotted-line position shown in Fig. 2, for example, removes the rod 28 to a greater distance from the rods 37 and 39, producing a longer arc of contact on the rod 39, which increases the wiping effect and tends to diminish the thickness of the coating on the upper side, while a contrary adjustment has the opposite effect. By performing either or both of these adjustments as conditions may demand, the thickness of the coating on either side of the strip as well as the tightness of the convolutions in the wound belt may be regulated at will.

On reaching the drum 21, the rubber coated strip is wound up in successive convolutions upon itself until the desired number of plies has been obtained, the strip is then cut off, the drum with the raw belt thereon is removed, and the belt is vulcanized in any suitable manner, preferably being wrapped in a fabric strip on the drum and cured in open steam. For a vulcanized belt it will be understood that the rubber cement contains a suitable proportion of sulfur. The friction exerted by the rods 28, 37 and 39 places the strip under tension so that the several layers will closely adhere without additional rolling, and air which might produce blisters during the vulcanization is excluded from between said layers.

The straight lengths of coated strip between the tanks 11, 11ª and the pulleys 23, 24 may represent the length of strip for making one belt, or may represent a multiple of this length, so that all of the rubber coating for each belt will be uniformly dried. A plurality of strips fed from a plurality of rolls 14 onto a corresponding number of drums 21 may be led through the tanks and over the pulleys side by side, in order to give increased capacity, the arrangement of arms 40 shown in Fig. 5 being adapted for three belts of two different widths.

My invention dispenses with the necessity of winding up the coated belt-making material in a liner and then unwinding it again when built into the belt, for in my improved method the tacky strip is wound directly into the belt simultaneously or concurrently with the performance of the coating operation or operations at another place or places on the strip, and thus a number of handlings are dispensed with and a great deal of time, labor and floor space is saved.

Various changes may be made in the details of construction of the apparatus and in the character of the different steps. The rubber or other adhesive coating may, for example, be applied in other ways but the use of rubber solution substantially in the manner set forth has the advantage of producing a high degree of penetration and adhesion of the rubber which is found to be of great importance in prolonging the life of the belt, especially small belts which are run at a high speed as in driving automobile fans, where the duty is very severe owing

to the heating up of the belt, the presence of oil, etc.

I claim:

1. The method of making flexible endless, laminated driving belts which comprises progressively immersing a continuous, flat strip of woven fabric in a bath of vulcanizable rubber cement, wiping off excess rubber cement, drying at least in part the rubber cement coating, winding the coated strip convolutely upon itself under tension developed in the immersing and the wiping steps to compact the layers and exclude air from between said layers, and then vulcanizing the belt.

2. The method of making flexible endless, laminated driving belts which comprises progressively immersing a continuous strip of woven fabric in a series of baths of rubber cement, wiping off excess cement after each bath and thereby imposing a drag upon the moving strip, evaporating the solvent after each bath, winding the tensioned, coated strip convolutely upon itself into a belt, and, by means of said winding, applying the force necessary to move the strip through the several steps, whereby the fabric strip is under a progressively increasing tension from the first coating to the winding step, and finally vulcanizing the belt.

3. A belt-making machine comprising means for supplying a continuous fabric strip, tension-producing means for progressively coating the strip with a rubber solution and scraping off excess solution, means for supporting the coated strip in a condition for drying, and means for winding the coated strip convolutely upon itself into an endless belt against the drag of said coating and scraping means, said tension-producing means being adjustable to regulate the degree of tightness in the convolutions of the wound belt.

4. A belt-making apparatus comprising means for supplying a continuous fabric strip, a plurality of tanks adapted to contain rubber cement, means for guiding the strip into and out of the tanks, means associated with each tank for wiping off excess cement to a predetermined thickness on both sides of said strip, and a belt-building drum for winding the coated strip convolutely upon itself against the drag developed in the coating and wiping operations, said wiping means being adjustable for the double purpose of regulating the thickness of the coating and varying the tightness of the convolutions in the wound belt.

In witness whereof I have hereunto set my hand this 1st day of August, 1921.

ABRAM E. FALOR.