

F. S. DICKINSON.
METHOD OF CONSTRUCTING PNEUMATIC TIRES.
APPLICATION FILED DEC. 14, 1915. RENEWED MAY 8, 1919.

1,315,364.

Patented Sept. 9, 1919.

2 SHEETS—SHEET 1.

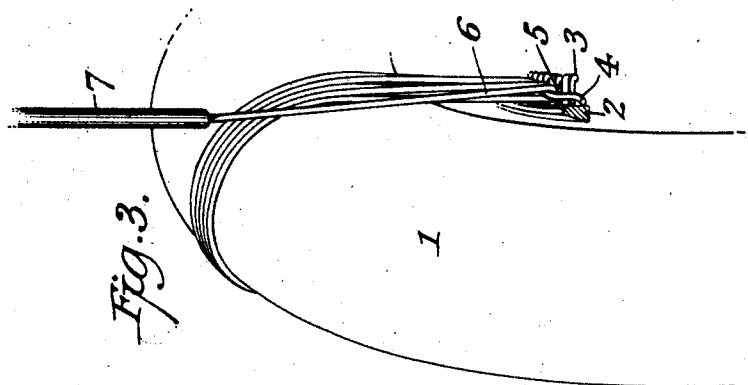


Fig. 1.

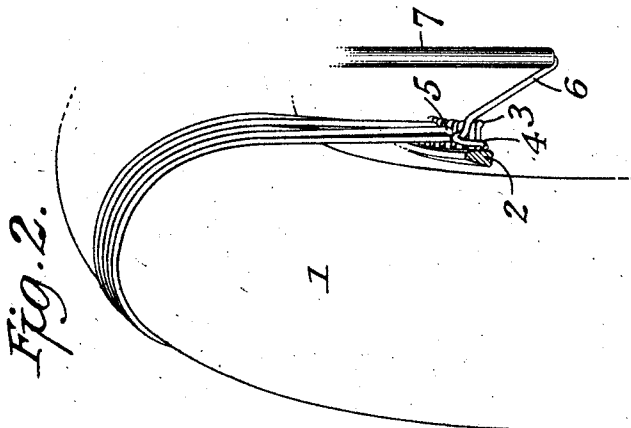


Fig. 2.

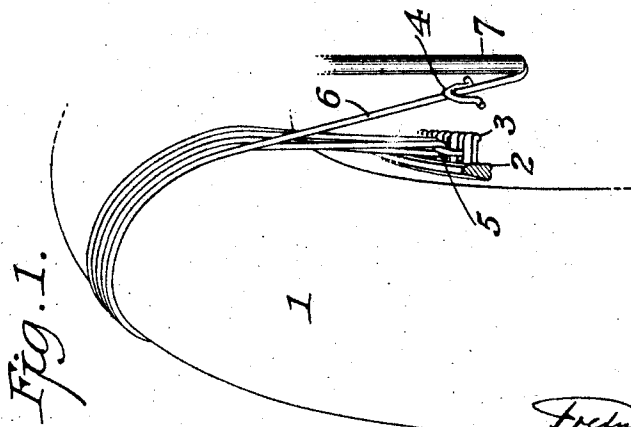


Fig. 3.

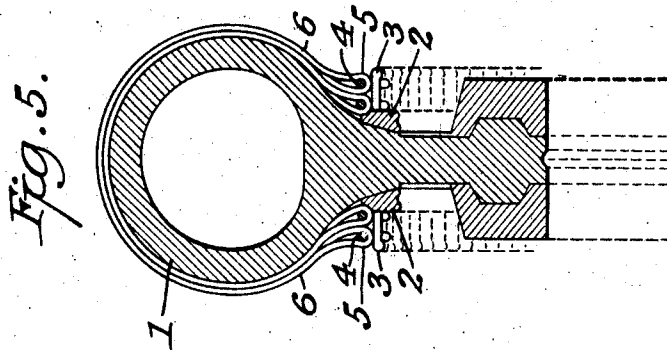
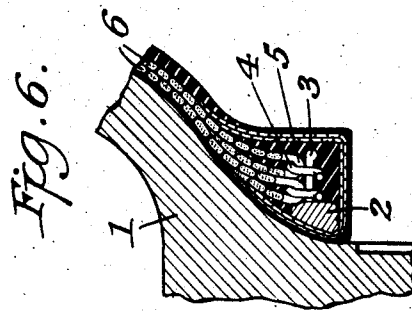
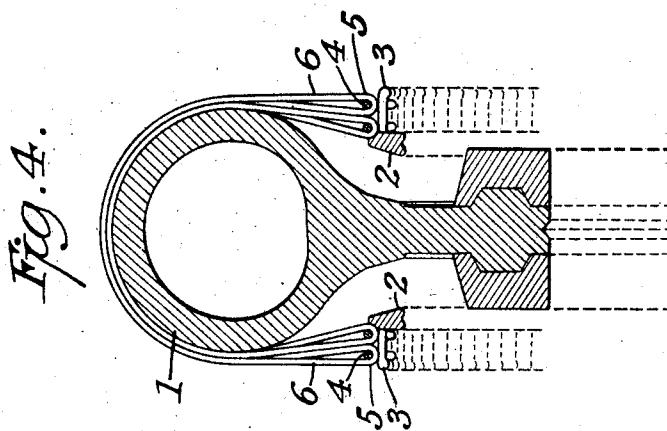
Inventor
Fredrick S. Dickinson,
By his Attorney,
W. Reed Little,
at

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UNITED STATES PATENT OFFICE.

FREDRICK S. DICKINSON, OF NEW YORK, N. Y.

METHOD OF CONSTRUCTING PNEUMATIC TIRES.

1,315,364.

Specification of Letters Patent.

Patented Sept. 9, 1919.

Application filed December 14, 1915, Serial No. 66,700. Renewed May 8, 1919. Serial No. 295,701.

To all whom it may concern:

Be it known that I, FREDRICK S. DICKINSON, a citizen of the United States, and resident of New York, in the county and State of New York, have invented certain new and useful Improvements in Methods of Constructing Pneumatic Tires, of which the following is a specification.

This invention relates to methods of constructing pneumatic tires of the "cord" type, and it has particular relation to an improved method of insuring the proper and required conditions of tension in the cords as they are laid and anchored in final position.

My present invention has special relation and adaptability to cord tires of the type shown in my co-pending application Serial No. 10,213, now Patent No. 1,294,427 which covers the features of construction of the improved cord body fabric of the type referred to, and to the conditions of the improved anchoring means whereby such cord body fabric is secured in position, anchoring means of the type referred to being indicated in my co-pending applications Serial No. 48,399, now Patent No. 1,234,142, Serial No. 48,400, now Patent No. 1,234,143, and Serial No. 48,401, now Patent No. 1,235,963, which cover certain types of anchoring means related to my general improvements in the art of tire construction.

The improved type of cord body fabric to which my present invention particularly relates, as indicated in my above-mentioned application Serial No. 10,213, is constituted by a length of cord which is turned or looped at the bead edge at an angle to the annulus of the tire and laid over itself at said turn or loop and spread or diverged therefrom in a gradual and continuous positional relationship in which the under portion of the length of cord gradually emerges from beneath the upper portion and said under and upper portions relatively spread and extend over the entire space area of the variable circumference of the tire.

The various types of improved anchoring means for securing such cord body fabric in its laid position, some of which are indicated in my above-mentioned applications Serial No. 48,399, Serial No. 48,400, and Serial No. 48,401, which have relation to my present improved method of constructing cord tires, embody an anchoring base which is in effect a bead ring and which structurally constitutes means for carrying

eyelet devices having their retaining portions positioned parallel to the annulus of the tire and through or under which the bead-edge loop of the cord passes.

The object of my present invention is to provide an improved method in which the cord of the cord body fabric is properly and effectively tensioned during the laying and anchoring thereof in final position, and whereby the requisite uniformity of tension will be insured under all conditions and maintained in the cord body fabric during its operative service when the tire is in use. To these ends, my invention comprises an improved method for equalizing, increasing, and maintaining uniform tension in the cords of which the body fabric is composed.

In tires of the cord type to which my improvements especially relate, the main essential conditions may be summarized as follows: first, that the initial strength of the cord be retained, without distortion, twisting, or fracturing; second, that the cords be laid up or built into the required shape or form of the body fabric under tension; third, that the tension on the cords be maintained throughout the process of laying up or constructing the cord body fabric and thereafter in its completed form and during service in use; fourth, that the cords be so laid as to compensate for the variability in the circumferential areas of the tire and cover the same in such close relationship that the flexing or bending action, resulting from the deflection in service conditions caused by the load carried or by inequalities of the road or by striking obstructions, causes no acute angular bends to occur in the carcass constituted by the cord body fabric.

In the usual methods as now employed for the construction of tires of the cord type, the essential conditions above stated are not effectively met. For instance, the first condition is vitiated by those methods in which a cylindrical twisted cable cord is initially subjected to operations which flatten it and thereby fracture the fibers of the yarn to an extent which very materially weakens it, and the flattened cord is further distorted by twisting it in the process of laying, under which conditions the position of the twist is constantly changing under deflection when the tire is in use, which sets up a frictional wear creating heat and causing

disintegration of the rubber compounds by which the cords are bonded together, and therefore the cords become separated and "blowouts" occur. The second and third essential conditions above noted are vitiated by the usual methods of construction as now employed which depend solely upon the adhesive characteristics of the rubber compound with which the cords are covered to maintain the position in which they are initially tensioned and laid, for, under these circumstances of constructing the tire, the initial heat required in the vulcanization to amalgamate the laid cords and rubber compound lessens the consistency of the compound and the cords slip within their own length or come back to their original shape and lengths, and any tensioning effect originally imparted in the laying of the cords is thus wholly lost. The fourth essential feature is met in some methods of construction, which, however, resort to the twisted conditions of the cords as above referred to and thus do not retain the initial strength of the cord required as a first essential, but this fourth essential feature is vitiated by those methods heretofore employed in which the full differential circumferential area of the tire is covered by packing and piling the cords over each other regardless of any frictional tendencies thereby created, or in which the cords are laid side by side parallel to the annulus of the tire at the rim-bead portion and radiate or diverge over the side and tread portions in a position in which they are separated by an intervening space and do not cover the full circumferential area, under which circumstances the rubber compound which fills the intervening space does not possess sufficient resistance to withstand the internal pressures occurring under conditions of use or to prevent the acute angular bends which result in tearing and wearing away of the rubber bond and the consequent destruction of the carcass constituted by the cord body fabric.

In my present improved method, in its special relation to the type of cord tire covered by my application Serial No. 10,213 and to types of anchoring means therefor as indicated in my other applications above noted, all the essential conditions above set forth are fully met, my improved method providing for the increasing, equalizing, and maintaining of the proper and requisite conditions of tension on the cords during the laying and anchoring thereof in final position and thereafter during the service of the tire in use, the tensioning method in its relation to the type of tire shown in my application Serial No. 10,213 insuring the first and fourth essential conditions above noted, and in its relation to the type of anchoring means indicated in my other

applications above referred to insuring the second and third essential condition, substantially as hereinafter described and particularly pointed out in the claims.

I have herein illustrated means whereby my improved method may be carried out, and have shown the construction of cord tire as embodied in my application Serial No. 10,213 and the construction of anchoring means as embodied in my application Serial No. 48,399, but it will be understood that my method may be carried out by other means or any suitable means which are adaptable to the essential steps of the method.

In the drawings—

Figure 1 is a detail perspective view illustrating the position of the cord prior to the first tensioning step which is effected by the anchoring thereof.

Fig. 2 is a detail perspective view corresponding to Fig. 1 and illustrating the position of the cord after it is tensioned by the anchoring means.

Fig. 3 is a detail perspective view corresponding to Fig. 1 and illustrating the position of the cord immediately following the first tensioning step and anchoring thereof.

Fig. 4 is a detail cross-sectional view showing in section the core or mandrel over which the cord is laid and the position of the latter after it is laid and anchored in the first tensioning step.

Fig. 5 is a detail cross-sectional view corresponding to Fig. 4 and illustrating the position of the laid and anchored cord in the second tensioning step and in its final position for embedding in the completed tire.

Fig. 6 is a detail cross-section illustrating the bead portion of the completed tire with the anchoring means and the tensioned cord fabric embedded therein.

Corresponding parts in all the figures are denoted by the same reference characters.

Referring to the drawings, 1 designates a core, former, or mandrel, which conforms to the annular and segmental cross-section of the inner contour of the completed tire and is suitably mounted in position. At each side of said mandrel is mounted an annular or ring member, 2, which forms the bead ring or anchor base of the completed tire. Said bead rings 2—2 are suitably mounted in their relation to the mandrel at opposite sides thereof and are of a diameter which brings their periphery at a point beneath the transverse segmental curvature of the body of the mandrel, said mounting preferably being a suitable attached connection with the mandrel structure and demountable therefrom. The bead rings thus form an inextensible base anchorage for the cords, to which the looped cords are connected and held in fixed position by eyelet devices carried by the bead rings.

The bead ring and eyelet anchoring means, as related to my improved method, will be fully understood by reference to my before-mentioned applications Serial No. 48,399, 5 Serial No. 48,400, and Serial No. 48,401, and I have herein illustrated the structural type thereof which is shown in the application Serial No. 48,399, in which the bead ring has a series of tangs, as at 3, projecting laterally with relation to the annulus of the 10 tire, over which tangs the eyelet devices, as at 4, are slipped or forced so that their retaining portions lay parallel to the annulus of the tire with the loop, 5, of the cord, 6, passing under or through the same, but it 15 will be understood that any adapted anchoring means, embodying the bead ring anchoring base and eyelets or analogous devices for carrying and retaining the cord, may be 20 employed in carrying out my improved method. The cord body fabric, as related to my improved method, will be fully understood by reference to my before-mentioned application Serial No. 10,213, which illustrates a laid construction in which a length 25 of cord is turned or looped at the bead edge at an angle to the annulus of the tire and laid over itself at said turn or loop and spread or diverged therefrom in a gradual and continuous positional relationship to extend over and cover the entire space area of 30 the variable circumference of the tire, as hereinbefore mentioned.

The bead rings 2—2 are initially positioned with relation to the mandrel 1 so 35 that they extend on a plane distant laterally with relation to the transverse diameter of the mandrel, said plane being preferably coincident with the outer side of the transverse segmental surface of the mandrel, as 40 illustrated in Fig. 4. In this initial position of the bead rings, the length of cord 6 is laid to cover the entire area at the side and tread portions of the mandrel and with 45 the loops 5 in anchored engagement with the eyelet devices 4 (see Figs. 1 and 4).

In Figs. 1 to 3 I have illustrated the laying of the first ply of the cord body fabric, while in Figs. 4 and 5 I have illustrated the 50 laid position of two plies of cord body fabric, one of which lays over the other, the first and succeeding plies being respectively laid and completed in succession, as will be understood by reference to my before-mentioned applications for patent. 55

In carrying out my improved method, the cords are first tensioned during the laying and anchoring thereof and are further 60 tensioned after they are laid and anchored, the tension being increased and equalized, and uniformly maintained during the construction of the cord body fabric and thereafter during the service of the tire in use.

The first tensioning step is effected and 65 maintained in the engagement of the cord

with the eyelet devices by which it is connected to the bead-ring anchor base. In carrying out this step, the cord is held under tension in its engagement under or through 70 the eyelet retaining and anchoring means, and after it is brought up to form the overlying bead-edge loop which passes under or through the eyelet means the latter serves to retain the tensioned position of the cord in which it has just been laid. Referring 75 to the type of anchoring means herein shown, my improved method of initially tensioning the cord is as follows: The cord is first brought to position opposite the end of the tang 3 of the anchoring base as shown 80 in Fig. 1, and the eyelet 4 is placed over the cord in position to carry the latter over the tang when the eyelet is pushed or slipped to position on the tang, as shown in Fig. 2. The portion of the cord extending through 85 the eyelet is then made taut, under the desired degree of tension, and is looped on the eyelet, as at 5, so that it lays over itself at the loop, and the length of cord is then brought up to overlie the mandrel 1, as shown 90 in Fig. 3. The cord is thus held against displacement, and is maintained under the tension in which it has been laid, by means of the eyelet which is anchored to the bead-ring base and under which the bead-edge 95 loop of the cord passes. The eyelet is pushed or slipped to anchored position on the tang 3 by any suitable means, such as a plunger mechanism (not herein shown), to bring it to the position illustrated in Fig. 2 for effectively retaining the cord under the tension 100 which has been given thereto, and the cord is carried in its various positions, as shown in Figs. 1 to 3, during the laying thereof under tension, by a needle, shown at 7, 105 through which the cord feeds and which is operatively governed by suitable mechanism.

It will be understood that in the laying and tensioning of the cord as just described, according to my improved method, the construction of the cord body fabric as herein 110 shown and described in its relation to the tensioning method is such that the bead-edge loops of the length of cord are at an angle to the annulus of the core or mandrel 1 and the cord lays over itself at said loops 115 and spreads or diverges from the looped portion in a gradual and continuous positional relationship to equalize or compensate for the progressive variable circumference of the core or mandrel and cover the full 120 area thereof.

When the cords are laid and tensioned as just described, with the bead rings 2—2 in the position with relation to the mandrel 125 1 hereinbefore set forth and shown in Fig. 4, they cover the entire surface area at the sides and tread portions of the mandrel with which they contact. In this position, the distance between the bead rings to which the 130

cords are then anchored is greater than the distance between said rings at the final position thereof illustrated in Fig. 5, and the distance between the anchored connection of the cords with the respective bead rings is less than in the final position just mentioned, as indicated in Figs. 4 and 5.

In carrying out the second increasing and equalizing tensioning step of my improved method, the tensioned and anchored cords are lengthened to the extent of the variation in the distances above mentioned by additional tensioning. This is accomplished, in the means herein shown, by bringing the anchoring bead rings 2—2 from their outer position shown in Fig. 4 toward each other to their inner position as shown in Fig. 5, the positional peripheral plane of the bead rings being maintained in this lateral movement. The movement of the bead rings to the final position shown in Fig. 5 is accomplished by any suitable governing mechanism.

The additional tensioning of the laid and anchored cords, as carried out in the second step of the method above set forth, tends to equalize or compensate for any variation of tension which might occur in the initial laying and tensioning and anchoring of the cords, and the increasing and equalizing tension furthermore operates to bring or lay the cords in closer relationship under the desired conditions which obviate any requirement for packing the cords of the body fabric by rolls under pressure or by other means which would tend to fracture and weaken the fibers of the cords.

From the foregoing it will be understood that the initial anchorage of the cords, as shown in Fig. 4, retains the cords in their laid and tensioned position, that the movement of the anchorage increases and equalizes the tension, and that the anchorage also retains the cords in their increased and equalized tension in the final conditions and position shown in Fig. 5.

When the final tensioned position shown in Fig. 5 is effected, the anchoring means and tensioned cords are then amalgamated to complete the bead and finished condition, by filling in with suitable caoutchouc materials, the whole being vulcanized or cured in the usual manner, the completed condition being illustrated in Fig. 6.

I do not desire to be understood as limiting myself to the detail features of the method of construction as herein illustrated and described, as it is manifest that variations therein may be resorted to in the adaptation of the method of construction to varying conditions according to the various anchoring means and the type of pneumatic casing to which the tensioned cord body fabric as produced by my method is adapted to be applied, without departing from the

spirit and scope of my invention and improvements. I therefore reserve the right to all such variations and modifications as properly fall within the scope of my invention and the terms of the following claims. 70

Having thus described my invention, I claim and desire to secure by Letters Patent:

1. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or former and anchoring the same in laid position, and then lengthening and tensioning the cords while in anchored position. 80

2. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in first laying the cords under tension over a core or mandrel, and then increasing and equalizing the tension upon the cords and permanently anchoring the bead-edge portion thereof in such tensioned condition. 85

3. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in first laying the cords under tension over a core or mandrel and permanently anchoring the bead-edge portion of the cords in such tensioned condition, and then increasing and equalizing the tension upon the cords while in anchored position. 90

4. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel, engaging the length of cord with an anchoring device at the bead-edge portion, and tensioning the laid cord and securing such tensioned condition by engagement with the anchoring device. 100

5. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel, engaging the length of cord with an anchoring device in connection with a base anchorage at the bead-edge portion, and tensioning the laid cord and securing such tensioned condition by a looped engagement with the anchoring device. 110

6. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel, permanently anchoring the laid cords at the bead-edge portion, and then moving the anchorage to lengthen and tension the cords while in anchored position. 115

7. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel, permanently securing the laid cords in 120

connection with an anchorage at the bead-edge portion, and then moving said anchorage toward the mandrel in a plane operative to increase the length of the anchored cords and thereby tension the same.

8. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords under tension over a core or mandrel and permanently anchoring the bead-edge portion of the cords in such tensioned condition, and then moving the anchorage means to increase and equalize the tension upon the cords while in anchored position.

9. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel, tensioning the laid cords and securing such tensioned condition by engaging the bead-edge portion with an anchoring device in connection with a base anchorage, and then moving the base anchorage to lengthen the cords and increase and equalize the tension thereof while in anchored position.

10. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel, securing the cords in laid position by a bead-edge anchorage means, tensioning the cords and retaining such tension by their anchorage engagement, then additionally tensioning the anchored cords, and maintaining such additionally tensioned condition by the same anchorage engagement.

11. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which

consists in laying the cords over a core or mandrel and in relation to a bead ring forming a base anchorage, tensioning the laid cords and securing such tensioned condition by applying an eyelet anchorage device in engagement with the cord and in connection with said base anchorage with its retaining portion parallel to the annulus of the mandrel, and looping the bead-edge portion of the cord under or through said eyelet device at an angle to the annulus of the mandrel to maintain the tensioned condition in which the cords are laid and anchored.

12. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel and in relation to a bead ring forming a base anchorage, applying an eyelet anchorage device in engagement with the cord and in connection with said base anchorage with its retaining portion parallel to the annulus of the mandrel, looping the bead-edge portion of the cord under or through said eyelet device at an angle to the annulus of the mandrel, tensioning the cords during the laying and anchoring thereof, additionally tensioning the cords after they are anchored, and maintaining such additional tensioning by the anchoring means.

13. The method of constructing the internal body fabric for the shoe or casing of pneumatic tires of the "cord" type, which consists in laying the cords over a core or mandrel, anchoring the cords in laid position, tensioning the cords after they are anchored, and maintaining such tension by the anchorage means.

In testimony whereof I have signed the foregoing specification.

FREDRICK S. DICKINSON.