Dec. 21, 1926. 1,611,829

A. L. FREEDLANDER

DRIVING BELT

Filed June 14, 1922 2 Sheets-Sheet 1

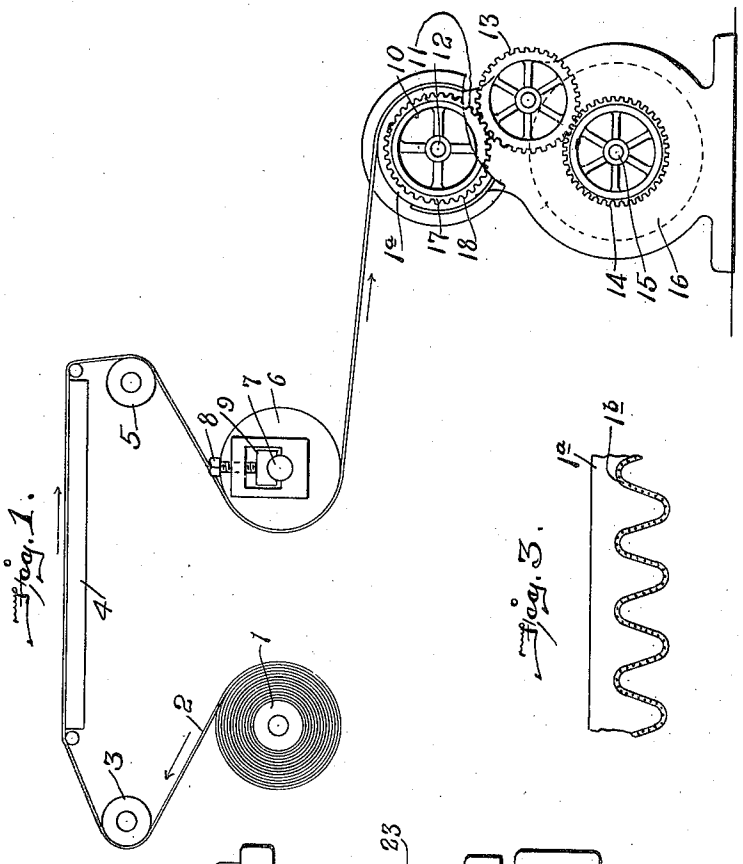

Fig. 1.

Fig. 3.

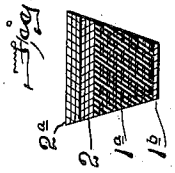

Fig. 4.

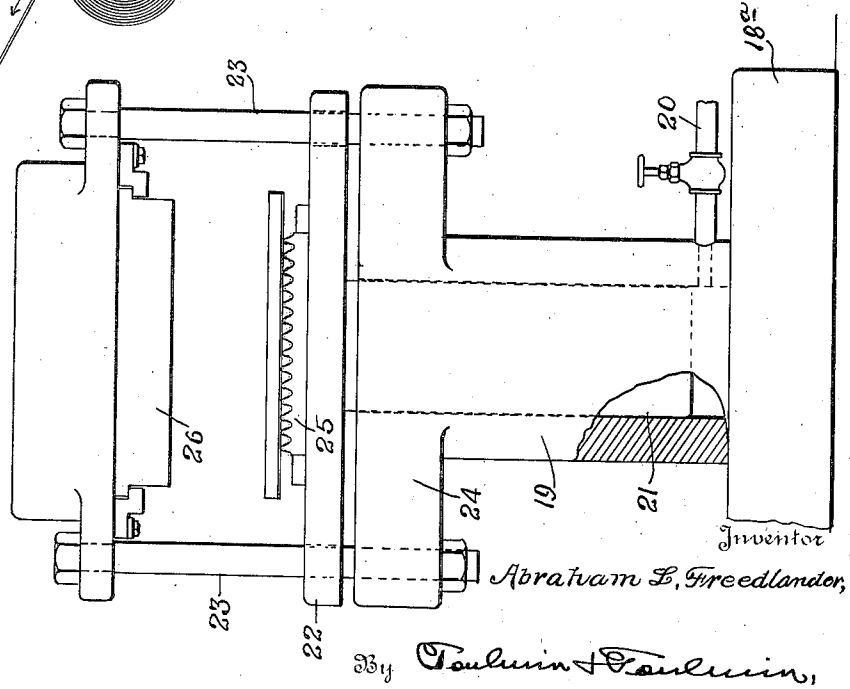

Fig. 2.

Inventor

Abraham L. Freedlander,

By Toulmin & Toulmin,

Attorneys.

Dec. 21, 1926. 1,611,829

A. L. FREEDLANDER

DRIVING BELT

Filed June 14, 1922 2 Sheets-Sheet 2

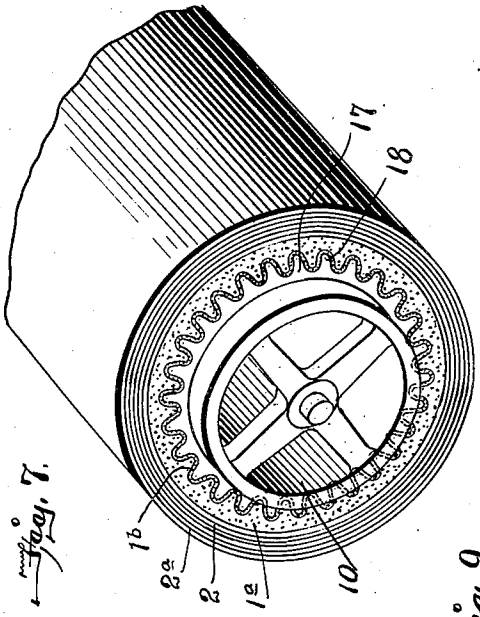

Fig. 7.

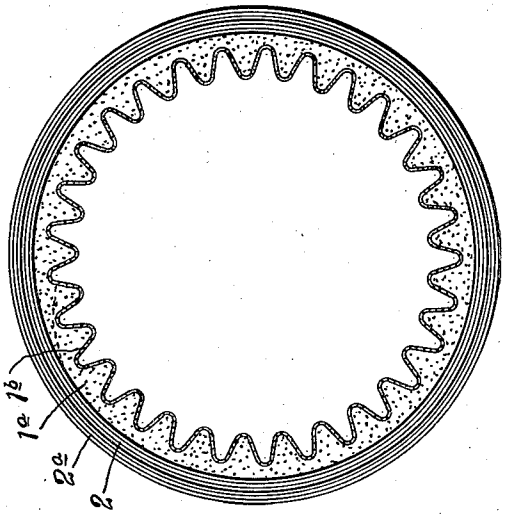

Fig. 9.

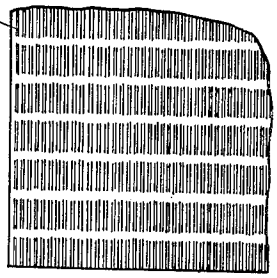

Fig. 6.

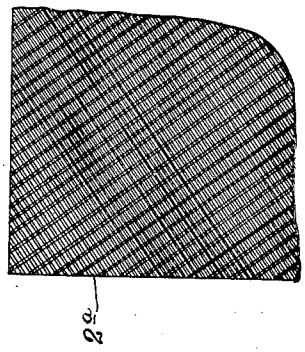

Fig. 5.

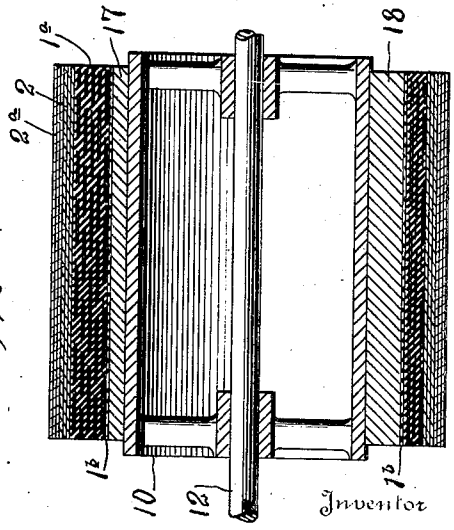

Fig. 8.

Inventor

Abraham L. Freedlander,

By Toulmin & Toulmin,

Attorneys

Patented Dec. 21, 1926. 1,611,829

UNITED STATES PATENT OFFICE.

ABRAHAM L. FREEDLANDER, OF DAYTON, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF THREE-FOURTHS TO THE DAYTON RUBBER MANUFACTURING COMPANY, OF DAYTON, OHIO, A CORPORATION OF OHIO, AND ONE-FOURTH TO GENERAL MOTORS RESEARCH CORPORATION, OF DAYTON, OHIO, A CORPORATION OF DELAWARE.

DRIVING BELT.

Application filed June 14, 1922. Serial No. 568,156.

This invention embraces an improved driving belt, designed particularly as a fan belt for use in automobiles, and a method of manufacturing or producing such a belt.

That branch of my invention which is embodied in the article or belt consists, essentially, of a belt comprised of a plurality of circumferential members—an inner or compression member, an intermediate or central member and an outer or tension member, each member being fabricated in this wise:

The compression member composed of soft vulcanized rubber mixed with cotton, wool or other fiber, the fibers preferably running crosswise, and fashioned into corrugations on the inner circumference.

The central member composed of rubberized cord fabric cut straight or parallel to the cords and in a pre-stretched condition, due to having been materially stretched before being combined with the other members.

The tension member composed of rubberized fabric cut on the bias or at an angle and in a pre-stretched condition, due also to having been materially stretched before being combined with the other members.

This results in the completed belt being substantially non-stretchable. As these fabric elements are of different characteristics and as each has a different function to perform when embodied in the complete belt, the percentage or degree of stretch to which each is subjected will differ from the percentage or degree to which the others are subjected.

That branch of my invention which is embodied in the method of producing this belt consists, essentially, in first fabricating the inner or compression member by mixing with soft vulcanizable rubber, cotton, wool or other fiber, with the fibers positioned essentially crosswise of the sheet or strip, and fashioning the inner circumference with corrugations; in fabricating the intermediate or central member by rubberizing a sheet or strip of cord fabric, with the cords lengthwise of the sheet or strip; in materially stretching such sheet or strip so that its stretchability, when it is embodied in the completed belt, will have been largely or substantially wholly eliminated; in fabricating the outer or tension member of rubberized fabric cut on the bias; in materially stretching such sheet or strip so that its stretchability, when it is embodied in the completed belt, will have been largely or substantially wholly eliminated; in forming these several members into broad endless rolls by first winding this compression member on a forming drum or structure; in then winding such central member on the already wound compression member; in winding such tension member on the already wound central member; and finally in vulcanizing, as by steam heat, the resulting rolls of material so fabricated and wound one upon the other.

The result of my invention in its two aspects is a driving belt which is substantially non-stretchable circumferentially; which, because of the construction referred to, notably the corrugated combined rubber and fibrous compression or inner member, will more readily bend and conform to and grip the formation of the pulley on which the belt is used, and enable the sides of the belt to more perfectly bind against the walls of the belt-grooves formed in the pulleys, and which will not lose such effects by any material subsequent stretching, and yet will be firm and nearly rigid transversely.

In the accompanying drawings forming a part of this specification:

Fig. 1 is a diagrammatic view of a tension and winding apparatus used in carrying out my method;

Fig. 2 is a diagrammatic view of a press for forming the projections and spaces of the compression member of the belt;

Fig. 3 is a detail enlarged view of a portion of the compression member showing such projections and spaces;

Fig. 4 is a cross sectional view of the belt;

Fig. 5 is a view of a piece of fabric cut on the bias;

Fig. 6 is a like view of a piece of mixed vulcanized rubber and canvas fiber, utilized in forming the inner or compression member of the belt;

Fig. 7 is a perspective view of the winding drum and the toothed spool thereon with a roll of belting on the latter;

Fig. 8 is a view of the winding spool and a roll of belting thereon; and

Fig. 9 is a side elevation of the belt complete.

I will first describe my method because it results in the production of the belt. In this way my invention will be more readily understood.

Referring first to the apparatus I prefer to employ in carrying out the stretching and winding steps of my method, the numeral 1 designates a roll upon which is wound, first, a quantity of material which is to comprise the compression member, and when this is consumed then a quantity of the material which is to comprise the central member, and when this in turn is consumed, then a quantity of the material which is to comprise the tension member. Or there may be, say, three rolls, such as 1, each roll carrying a quantity of the respective materials and each roll in turn mounted in the machine.

As shown in Fig. 1, the material 1^a to constitute the compression member has already been wound on the spool carried by the drum, and the material 2 constituting the central member is in the act of being wound on the compression member, the winding being nearly complete, as usually three layers are sufficient. Later in the process the material 2^a, comprising the tension member will be wound on the central member.

As illustrating the operation of the apparatus employed for winding and tensioning the materials it will be seen that the material comprising the central member, generally designated 2, passes over a guide roller 3, a flattening platform 4, another guide roller 5 and a tension roller 6. The shaft 7 of this latter roller is put under different degrees of friction through a screw 8 and its friction block 9, to cause the roller 6 to revolve with more or less resistance. In this way the required tension for the central and tension members is put upon the material as it undergoes the winding step.

A drum 10 having a gear wheel 11 is mounted on a shaft 12 and rotated by an idler gear 13 driven by a driving gear 14 on the shaft 15 of an electric or other motor generally indicated at 16. On this drum is fitted a removable corrugated spool 17. The materials are wound directly on this spool which is carried by the drum, the spool being removable with them as a whole, the corrugations of the spool receive the projections and enter the spaces formed by the corrugations on the inner surface of the compression member of the belt which are formed by a press, such as illustrated in Fig. 2. This press comprises a base 18^a with a cylinder 19 into which steam is introduced, as through a pipe connection 20 to elevate a plunger 21 and its platen 22, the latter guided by ways or rods 23 mounted on the cylinder head 24. A corrugated forming plate 25 is spaced on the platen 22 and designed to receive the inner surface of the material of which the compression member of the belt is to be composed. This inner surface is laid upon the corrugated forming plate 25 and when the plate is elevated until this compression member contacts with the stationary head 26, the teeth of the forming plate imbed themselves into the soft rubber and form projections and spaces constituting the corrugations on this belt member. See Figs. 2 and 3 of the drawings, the latter showing the result of this treatment, in which condition the compression member is subsequently mounted on the roller 1 and fed to and rolled upon the corrugated spool of the drum, the teeth on the spool corresponding in size and position to the spaces and projections which form the corrugations on the belt member.

A knife which is utilized in cutting the roll of belting into the individual belts forms another invention independent of this one and is the subject of an application for a patent filed by Amos Puterbaugh June 19, 1922, Serial No. 569,410.

It will now be seen that when the motor is put in motion the several gears will rotate the drum with its spool, so that the different sheets or strips which constitute the respective members of the belt can be wound on the spool, in succession, and each sheet or strip put under the required tension, as determined by the adjustment of the tension device, applicable to each sheet or strip.

Preceding the stretching and winding steps it will be understood that the material for each belt member is fabricated. The compression member is fabricated by mixing soft vulcanizable rubber with fiber, preferably of cotton or wool. This mixing of the rubber and fiber is preferably performed by a rubber mixing mill—a pair of rolls, one of which travels faster than the other. The body of rubber so mixed with the fiber is run through a calender machine which forms it into a sheet in which the fibers are found to tend to position themselves lengthwise of the strip. After the sheet is formed it is cut off in strips crosswise of the sheet so that the fibers will stand crosswise of the strip. The effect of running the rubber through such calender machine is to deprive it of any real stretchability lengthwise, but leave it unaffected crosswise. Therefore, the strips are cut crosswise of the sheet and this lateral stretchability in the sheet becomes longitudinal stretchability in the strips. A canvas strip 1^b is preferably also laid over the rubber on the inner surfaces so as to cover the corrugations.

The central member 2 is fabricated by taking a sheet or strip of cord fabric and rubberizing it in the well known way of rubberizing fabric. The strips are cut so that the chords run lengthwise the strip, sometimes called a straight or parallel cut.

The fabrication of the tension member 2^a is done by rubberizing a sheet of fabric cut on the bias, see Fig. 5, at say an angle of 45 degrees to the warp or lengthwise strands, which are crossed by the woof.

The characteristic of the compression member is extreme yieldability, as it bends round the pulley, this quality being superinduced by the corrugated formation of the inner circumference, the spaces so formed permitting the belt as a whole to more perfectly hug the pulley or bend to conform to its circumference. The characteristic of the central member, besides extreme strength, is substantially non-stretchability due to the essential stretchability of the cord fabric having been taken out by the stretching operation which precedes the actual winding. The characteristic of the tension member is also strength and substantial non-stretchability due to the fabric having been prestretched.

It will now be seen that my method consists in fabricating, substantially in the manner above described, the material for the inner or compression member, with its corrugations and quality of yieldability; in fabricating the material for the central member, likewise in the way above pointed out, with its practically non-stretchable quality; in fabricating the material for the tension member, also in the manner pointed out, with its quality of practical non-stretchability, so that these two members will resist the tension they are put under in use; in subjecting these respective materials of the central and tension members to a tensioning or stretching operation and in winding the three elements, successively, on the drum, first winding the material of the compression member and properly uniting the ends of enough material to girth the spool; in then tensioning and winding the material composing the central member with as many laps as desired, say three, which is preferable; and finally in tensioning and winding the material of the tension member again with as many laps as desired, preferably three.

When the belt has been thus formed and built up it is in the form of a roll of belting material, as best seen in Fig. 8. In this state it is vulcanized by the usual vulcanizing process employed in the manufacture of pneumatic rubber tires. The effect of the vulcanization is to cause the several members, and the laps of material composing them, all to "run" together or unite to make a finished and homogeneous structure.

Referring now to the belt that results from this method, attention is called to Figs. 4 and 9 where the same is illustrated in its complete condition, having been cut or severed from the roll of belting on the spool. This belt so made has the compression member, the central member and the tension member, characterized by the fact that the compression member has corrugations and is highly yieldable in respect to the rubber ingredient, while both the central and tension members are practically or substantially non-stretchable.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. The herein described method of making an endless roll of driving belt, material from which individual belts are to be cut, consisting in fabricating material for the compression member including corrugating the inner surface; in fabricating other material for the central member; in fabricating still other material for the tension member; in pre-stretching the central and tension members; in winding on a suitable instrument the material of the compression member; in winding on the latter the material for the central member; in winding on the latter the material for the tension member; and in vulcanizing the roll thus built up.

2. The herein described method of making an endless roll of driving belt material from which individual belts are to be cut, consisting in fabricating the compression member of soft vulcanizable rubber mixed with fiber, including corrugating the inner surface; in fabricating the central member of rubberized cord fabric; in fabricating the tension member of rubberized fabric; in winding the first of these materials on a rotating instrument; in winding the second on the first; in winding the third on the second; and in vulcanizing the roll so built up.

3. The herein described method of making an endless roll of driving belt material from which individual belts are to be cut, consisting in fabricating the compression member of soft vulcanizable rubber mixed with fiber, including corrugating the inner surface; in fabricating the central member of rubberized cord fabric; in fabricating the tension member of rubberized fabric; in winding the first of these materials on a rotating instrument; in winding the second on the first; in winding the third on the second; in vulcanizing the roll so built up; and in prestretching the material for the central and tension members before winding them.

4. The herein described method of making an endless roll of driving belt material from which individual belts are to be cut, consisting of fabricating the compression member of soft rubber and fiber, including corrugating the inner surface; in fabricating the

central member of rubberized cord fabric; in fabricating the tension member of rubberized fabric cut on the bias; in taking the material for the central and tension members and subjecting them to a stretching operation and winding operation simultaneously conducted; in first winding the material of the compression member; in winding thereon that of the central member; and in finally winding on the latter the tension member; and in vulcanizing the composite belt roll thus formed.

5. The herein described method of making a roll of driving belt material, consisting of a compressible member formed of rubber and fiber with corrugations on the inner surface; of a central member composed of rubberized cord fabric cut parallel; and a tension member of rubberized fabric cut on the bias; in first applying on a winding instrumentality the material of the compression member, then the material of the central member on the compression member, and then the material of the tension member on the central member; in pre-stretching the material of the central and tension members; and in vulcanizing the whole to form a complete roll of belting.

6. The herein described method of making an endless roll of driving belt material from which individual belts are to be cut, consisting in fabricating the compression member, including corrugating the inner surface; in fabricating other material for the central member; in fabricating still other material for the tension member; in winding on a suitable instrument the material of the compression member; in winding on the latter the material of the central member; in winding on the latter the material of the tension member; and in vulcanizing the roll thus built up.

In testimony whereof, I affix my signature.

ABRAHAM L. FREEDLANDER.