United States Patent [19]

Eng et al.

[11] **3,724,284**

[45] **Apr. 3, 1973**

[54] **V-BELT AND METHOD OF FORMING SAME**

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[22] Filed: **May 17, 1971**

[21] Appl. No.: **143,993**

[52] **U.S. Cl.** **74/234,** 156/140, 161/91

[51] **Int. Cl.**.....**F16g 5/00**

[58] **Field of Search** 74/234, 237; 156/137, 140; 161/89, 91

[56] **References Cited**

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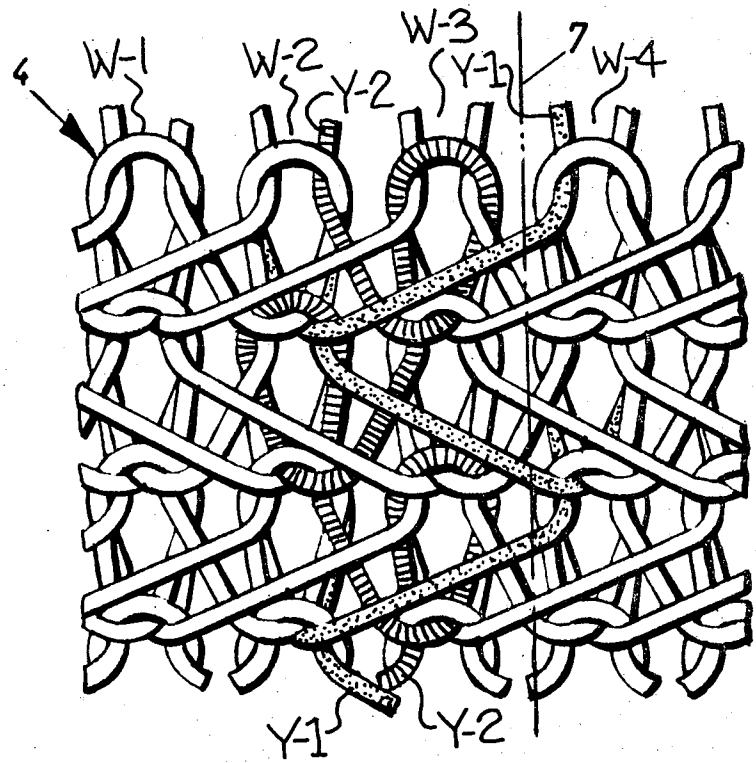
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[57] **ABSTRACT**

This V-belt is provided with a textile jacket covering the main body of the belt, and the textile jacket is in the form of a warp fabric knit of thermoplastic synthetic yarns. This fabric includes interconnected stitch chains forming wales in the knit fabric and is cut lengthwise, parallel to the wales into strips which are applied to the belt body with the wales extending in the longitudinal direction of the belt. The textile jacket is vulcanized to the belt body and completely surrounds the belt profile.

10 Claims, 3 Drawing Figures



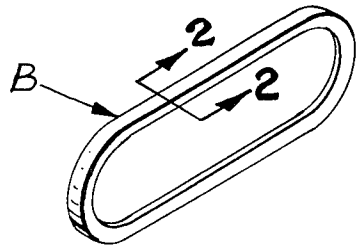


Fig.1

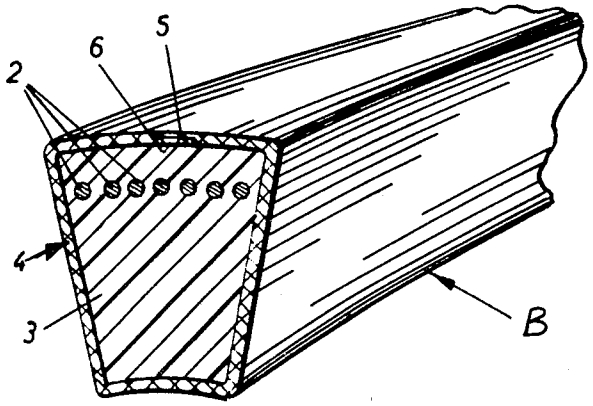


Fig.2

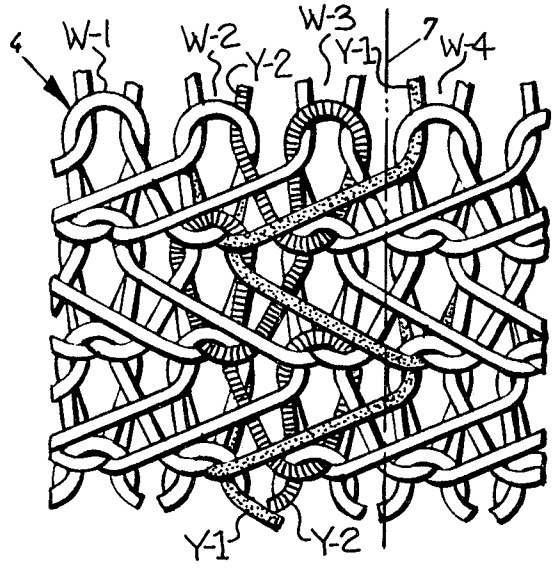


Fig.3

V-BELT AND METHOD OF FORMING SAME

This invention relates generally to a power transmission V-belt and method of forming same, and more particularly to an improved V-belt including an elongate body and a textile jacket or cover of a warp knit fabric with the wales of the fabric extending in the longitudinal direction of the belt to provide sufficient stretch and recovery that the textile jacket conforms to the configuration of the belt body as the V-belt passes around pulleys and the like.

Most V-belts currently being manufactured include an elastomeric core or body having parallel reinforcing threads or cords embedded therein and having a textile jacket or covering vulcanized to the outer surface and covering the belt body. The textile jacket or covering is usually formed of a woven fabric. In order to obtain the maximum amount of elasticity or stretchability in this woven fabric, it has been the practice to cut strips of the woven fabric at an angle of approximately 45° to the warp and weft yarns; i.e., along the bias of the fabric. The diagonal cutting of woven fabric to form this type of textile jacket results in waste material and limits the length of the strips which may be cut from the fabric. Also, the woven fabric does not provide a long wear life because the diagonally extending warp and weft yarns do not have the desired amount of stretch and recovery and the textile jacket tends to become worn and frayed after some use of the V-belt.

With the foregoing in mind, it is an object of the present invention to provide an improved power transmission V-belt and method of forming the same which includes a textile jacket formed of a warp knit fabric to provide sufficient stretch and recovery that the jacket and V-belt has a long wear life.

In accordance with the present invention, the warp knit fabric is cut into longitudinal strips in the same direction in which it was knit; i.e., parallel to the knit wales so that very long continuous strips of the knitted fabric may be provided. The warp fabric is knit of thermoplastic synthetic yarns and is heat set to control the amount of elongation or stretchability. Also, the knit fabric is treated to improve its ability to adhere to an elastomeric material with which it is impregnated, such as rubber or the like. A strip of the warp knit fabric is applied to the body of the V-belt and completely surrounds the same with the wales of the fabric extending longitudinally and parallel with the belt body. The warp knit fabric jacket is vulcanized in this position so that the jacket becomes a permanent part of the V-belt.

The thermoplastic synthetic yarns of the warp knit fabric are preferably of the continuous filament type and provide longer wearability. Also, the stretch and recovery of the textile jacket of the V-belt corresponds more nearly to the stretch and recovery of the elastomeric body of the belt so that the tendency for separation of the jacket from the belt body is reduced. The thermoplastic synthetic yarns forming the warp knit fabric provide greater strength than yarns formed of spun staple length fibers so that it is possible to manufacture smaller V-belts having the strength and wearing qualities of larger V-belts of the type having a jacket of woven textile fabric.

This invention is also concerned with a method of forming an improved V-belt which comprises the steps of knitting thermoplastic synthetic yarns to form a warp knit fabric having interconnected stitch chains forming longitudinally extending wales, and slitting the knit fabric along lines extending parallel to the longitudinally extending wales to form strips of predetermined width. The treated and heat set knit fabric or the heat set knit strips are impregnated with a suitable elastomeric material, such as rubber or the like, and a knit strip is applied to the belt body while overlapping opposed sides of the strip to completely surround the belt body. The covered belt is then vulcanized so that the textile jacket of warp knit material becomes a unitary part of the V-belt.

Other objects and advantages of the present invention will become apparent in connection with the following description of the drawings in which:

FIG. 1 is an isometric view of a typical V-belt and including a textile covering or jacket formed in accordance with the present invention;

FIG. 2 is an enlarged cross-sectional view through the V-belt shown in FIG. 1, being taken substantially along the line 2—2, and illustrating a portion of the V-belt in elevation; and

FIG. 3 is a somewhat schematic view of a fragmentary portion of the warp knit fabric illustrating the manner in which it is formed with laps interconnecting the stitch chain wales of stitch loops, the wales extending between the bottom and the top of the fabric shown in FIG. 3.

The power transmission V-belt B generally includes an elongate belt carcass or body 3 and a surrounding textile jacket or covering, broadly indicated at 4. The belt body 3 is preferably formed of elastomeric material, such as rubber, and is usually provided with reinforcement threads or yarns 2 embedded therein and extending in the longitudinal direction.

The cover or jacket 4 is formed of a strip of warp knit fabric having opposed longitudinal edges, indicated at 5 and 6 in FIG. 2, which overlap along the outer radial face of the belt. The strip of warp knit fabric is cut from a suitable type of warp knit fabric, such as that illustrated in FIG. 3. This fabric is knit of two sets of continuous filament thermoplastic synthetic warp yarns Y–1 and Y–2 to form longitudinally extending wales of interconnected stitch loops forming chains, indicated at W–1 through W–4.

During the knitting of the fabric, the set of warp yarns Y–1, one of which is speckled in FIG. 3 for purposes of identification, forms stitch loops in each course and the yarns are lapped back and forth between spaced wales and across one wale to form relatively long diagonally extending laps. The set of warp yarns Y–2, one of which is illustrated as being striped in FIG. 3, forms stitch loops in successive courses and the yarns are knit together in plated relationship with stitch loops of the yarns Y–1. The yarns Y–2 are lapped back and forth between immediately adjacent wales to form relatively short diagonally extending laps.

This type of warp knit fabric is easily adaptable for heat setting so that it contains the proper amount of elasticity in its longitudinal direction for use as a covering for V-belts and the like and has good recovery from stretch so that the outer and inner peripheral surfaces of the V-belt will readily conform to the configuration of drive elements, such as pulleys or the like around which the belt is entrained. The elasticity of this particular type of knit fabric is sufficient that the outer

peripheral surface of the V-belt may stretch while the inner peripheral surface contracts as the belt passes around the drive elements with which it operates. The yarns forming the warp yarn sets Y–1 and Y–2 are preferably continuous filaments of a thermoplastic synthetic material, such as polyamide (nylon) or polyester (Dacron). These types of synthetic thermoplastic yarn have very high breaking strength and have a long wear life as they are continuously stretched and flexed during use of the V-belt.

To prepare the warp knit fabric for use as covering for V-belts and the like, the fabric is preferably heat set while being held under the desired degree of tension to control the amount of elongation or stretchability in the fabric. A suitable treatment is preferably applied to the fabric to improve its ability to adhere to rubber. This treatment agent may be in the form of isocyanat which is applied to the fabric prior to the heat setting. The isocyanat is applied in liquid form with a solvent to provide the proper consistency so that the desired amount of the isocyanat is applied to the fabric to cause the elastomeric material to adhere thereto. The quantity of isocyanat applied to the fabric is below the level which would cause stiffening of the fabric and below the level which would cause the yarns of the stitch loops to stick together. The heat set and treated fabric is then immersed in an elastomeric solution, such as liquid rubber, and then dried before it is cut along longitudinally extending lines, such as indicated by the dash-dot line 7 in FIG. 3. The slit lines extend walewise so that the wales of the fabric extend longitudinally of each strip. The fabric is cut into strips of a predetermined width which is sufficient to wrap around and cover the body 3 of the particular V-belt to which it is to be applied. Opposite side edges of the strip overlap a small amount on the outer peripheral surface of the V-belt (FIG. 2).

If desired, the heat set and treated warp knit fabric may be slit before it is impregnated with the elastomeric solution. In this case, the fabric strips are immersed in the elastomeric solution, such as liquid rubber, and then dried in any suitable manner. In either instance, the V-belt is vulcanized with the impregnated warp knit jacket positioned thereon so that the textile jacket becomes a permanent and unitary part of the V-belt.

The improved V-belt is extremely strong and wear-resistant and may be safely subjected to temperature ranges which are well above the temperatures to which V-belts are normally exposed during operation. The enhanced flexibility, strength, stretchability and recovery of the textile jacket aid in preventing the separation of the covering jacket from the belt body during use to thereby increase the wear life of the belt. Although other types of warp knit stitch constructions or patterns may be utilized for forming the knit fabric illustrated in FIG. 3, it has been found that this particular stitch construction provides the amount of strength, flexibility, stretchability and recover required for most types of V-belts. In order to provide the desired degree of flexibility and wearability to the V-belt, it is preferred that the warp knit fabric be formed of warp yarns of relatively fine denier. For example, it is preferred that the yarns Y–1 and Y–2 be within the range of about 40 to 120 denier.

In the drawings and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

That which is claimed is:

1. A power transmission V-belt comprising an elongate belt body and a textile jacket covering said belt body, said jacket comprising a warp knit fabric having interconnected stitch chains forming wales extending longitudinally of the knit fabric, said knit fabric being heat set to control the amount of elongation thereof, said knit fabric being embedded in elastomeric material and vulcanized to said belt body, said textile jacket completely surrounding the profile of said belt body with the knit wales of said warp knit fabric extending longitudinally of and parallel with said belt body to provide sufficient stretch and recovery that said textile jacket conforms to the configuration of said belt body as the same passes around drive pulleys and the like.

2. A power transmission V-belt according to claim 1 wherein said textile jacket is knit of thermoplastic synthetic warp yarns.

3. A power transmission V-belt according to claim 2 wherein said warp yarns are within the range of about 40 to 120 denier.

4. A power transmission V-belt according to claim 2 wherein said thermoplastic synthetic yarns are continuous filament polyamide.

5. A power transmission V-belt according to claim 2 wherein said thermoplastic synthetic yarns are continuous filament polyester.

6. A power transmission V-belt according to claim 1 wherein said warp knit fabric is formed of two sets of thermoplastic synthetic warp yarns.

7. A power transmission V-belt according to claim 6 wherein said warp yarns of each set are knit together in stitch loops in every wale, and wherein the warp yarns of one set are lapped back and forth between immediately adjacent wales and the warp yarns of the other set are lapped back and forth between spaced wales to form relatively long laps diagonally extending across at least one wale.

8. A method of forming a power transmission V-belt including an elongate belt body and a textile jacket covering the belt body, said method comprising the steps of knitting a fabric of thermoplastic synthetic warp yarns while forming wales of interconnected stitch chains extending longitudinally of the knit fabric, heat setting the knit fabric while being held under controlled tension, slitting the knit fabric along lines extending parallel to the wales of the fabric to form strips of predetermined width, applying a strip of the knit fabric to the outer profile of the belt body to completely cover the same and with the wales extending parallel to the length of the elongate belt body and vulcanizing the knit fabric jacket to the belt body.

9. A method according to claim 8 including the step of treating the knit fabric to improve its ability to adhere to the elastomeric material without substantially changing the flexibility characteristics of the knit fabric.

10. A method according to claim 8 including the step of impregnating the knit fabric with an elastomeric material, prior to slitting the fabric to form the strips.

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