

METHOD OF MANUFACTURING RAW-EDGE V-BELTS

The present invention relates to a method of manufacturing raw-edge V-belts, and more particularly to a simple method of manufacturing raw-edge V-belts by grinding a plurality of portions simultaneously over a 100-inches-or-more long, flat-belt-shaped vulcanized annular body installed on two drums and cutting such ground portions.

Background Art

Conventionally, there are two types of method in manufacturing raw-edge V-belts. One is an angle-cut method and the other is a method in which a vulcanized annular body is cut in square and then ground in V form (SCAM). The former method comprises the steps of: (1) forming a laminated body of belt on an iron cylindrical drum; (2) vulcanizing the belt forming body; (3) cooling the belt forming body; (4) removing the vulcanized and sleeve-like belt forming body from the drum; (5) storing the removed belt forming body; (6) transferring the belt forming body to an expander drum and providing V-form cutting to individual V-belts; (7) siding to grind the side surfaces of each V-belt by winding the V-belt on a pair of pulleys for reducing the eccentricity of the V-belt; (8) inspecting the sided V-belt; and (9) deburring the inspected V-belt.

The latter method to be taken in lieu of the above-described angle-cut method involves the steps of cutting the annular body in square to a predetermined width, turning each belt inside out, and then grinding the side surfaces in V form.

However, the above-described methods are only satisfactorily applicable to manufacturing belts whose size is relatively short (less than 100 inches) and thus presents problems when applied to manufacturing relatively long belts (100 inches or more). In the former method it is difficult to make the vulcanized annular body for large width belts perfectly circular because it involves the expansion of an expander to which the vulcanized annular body for belts whose width is large is transferred. Thus, when providing V-form cutting to the vulcanized annular body, the upper width and angles of the belt becomes erratic, thereby requiring an additional step of siding, or grinding the side surfaces of the V-belt. This causes inconveniences of not only producing much scrap but also complicating the manufacturing process.

Although variations in the width and angles of the V-belt are not so noticeable as in the former method, the process of grinding the V-shaped grooves on a single belt basis in the latter method impairs its productivity and may even end up with increasing the manufacturing cost.

Disclosure of the Invention

Based on an extensive study made to overcome the above problems, the object of the present invention is to provide a

method of manufacturing raw-edge V-belts, which ensures high accuracy in cutting and satisfactory working efficiency by grinding a plurality of V-shaped portions simultaneously on a relatively long, flat-belt-shaped vulcanized annular body wound on two drums and then cutting the ground V-form portions.

To achieve the above object, according to the present invention there is provided a method of manufacturing raw-edge V-belts comprising the steps of:

10 forming an unvulcanized belt annular body inside out by winding respective components constituting the elongated portion, tension-resistant portion, and compressed portion of the belt in laminated form on the circumferential surface of a forming drum;

15 vulcanizing the unvulcanized belt annular body to obtain a vulcanized annular body;

revolving the vulcanized annular body by winding on a pair of drums consisting of a drive drum and an idle drum thereby to grind V-shaped grooves on the surface of the vulcanized annular body with a grinding wheel consisting of a group of grindstones whose cross-section is V shaped which is in pressured contact with one of the drive or the idle drum;

20 causing projections arranged on a positioning member which is capable of gradually increasing the depth of engagement to engage with the V-shaped grooves; and cutting the vulcanized annular body into bolts.

One example of a method according to the present invention will now be described with reference to the accompanying drawings, in which:

30 Fig. 1 is a schematic front view of a manufacturing apparatus having a grinding means for use in the method of the present invention; Fig. 2 is a partial

sectional view of a grinding wheel; Fig. 3 is a partial transverse sectional view showing a grinding process; Fig. 4 is a perspective view of a raw-edge V-belt manufactured by the manufacturing method according to the present invention; and Fig. 5 is a partial longitudinal sectional view showing the manufacturing process of a vulcanized annular body.

- (1) a drive drum
- (2) an idle drum
- (3) a grinding wheel
- (4) a V-shaped grindstone of the grinding wheel
- (9) an unvulcanized annular body
- (10) a vulcanized annular body
- (11) a positioning roller
- (12) a V-shaped projection of the positioning roller
- (13) a pressure means
- (14) a V-shaped groove
- (15) a combined belt
- (16) a multi-blade cutter
- (17) a raw-edge V-belt

A specific embodiment of the present invention will now be described with reference to the accompanying drawings.

Fig. 5 is a partial longitudinal sectional view showing the manufacturing process of a vulcanized annular body for use in the present invention. An elastic canvass (5) such as a biased canvass good in elasticity having a warp intersecting a

weft at an angle of 90 to 155° is wound by one or more plies around a cylindrical formed drum (20) in the circumferential direction, i.e., in the longitudinal direction of a belt to be manufactured. Then, after winding thereon an upper rubber layer (6), a low-elongation, high-strength tension-resistant rope (7) made of such a material as nylon, polyester, aromatic polyamide, or fiberglass is wound spirally under a predetermined tension, and a lower rubber layer (8) that is thicker than the upper rubber layer (6) is laminated thereon thereby to form an unvulcanized belt annular body (8) inside out.

The lower rubber layer (8) may be arranged by filling, as necessary, various short fibers aligned in the width direction of the belt.

The unvulcanized belt annular body (9) is subjected to the following vulcanization process by a well-known pressure and heating means to obtain a wide, flat-belt type vulcanized annular body (10). This vulcanized annular body (10) is taken out from a forming drum (20) and subjected to a grinding process. Fig. 1 is a schematic front view of a manufacturing apparatus having a grinding means for forming a raw-edge V-belt. Between a pair consisting of a drive drum (1) and an idle drum (2) is the vulcanized annular body (10) installed, and on the front surface of the vulcanized annular body (the side of the lower rubber layer (8)), or more specifically, on either one of the drive drum (1) or the idle drum (2) are a

grinding wheel (3) and a positioning roller (11), the positioning roller (11) being located adjacent to this grinding wheel (3).

The surface of the drive drum (1) or the idle drum (2) located on the side where the grinding wheel (3) is disposed is coated with a disposable protection member (not shown). This grinding wheel (3) is a long cylindrical body as shown in Fig. 2 and is provided with a plurality of grindstones (4) whose cross-section is V-shaped around its circumference. This grindstone-equipped grinding wheel (3) is automatically rotated in a direction reverse, or in some case, identical to that of the drive drum (1), and is gradually movable in the radial direction as shown by the arrow (X).

On the other hand, the positioning roller (11) is arranged close to and in immediate front of the grinding wheel (3). More specifically, as shown in Fig. 1, when the grinding wheel (3) is arranged on the drive drum (1) so as to be in contact therewith, the positioning roller (11) also find its position on the drive drum (1). Thus, the positioning roller (11) is pivotably supported on the drive drum (1), thereby being allowed to efficiently achieve its function. The positioning roller (11) has a long cylindrical shape similar to that of the grinding wheel (3) and has on its cylindrical circumferential surface a group of projections (12) each of which is identical in pitch and shape to each of the V-shaped grindstones arranged on the grinding wheel (3). The positioning roller (11) is also

constructed so as to be pressed on the vulcanized annular body (10) by a well-known pressure means (13) such as a spring at the time the vulcanized annular body (10) is ground by the grinding wheel (3). Each of the projections (12) of the positioning roller (11) is made of either rubber, a synthetic resin, or a metal.

In the apparatus thus constructed, the vulcanized annular body (10) is revolved by rotating the drive drum (1). Under this condition, the grinding wheel (3) is gradually pressed on the surface of the vulcanized annular body (10) by being rotated in the direction reverse to that of the drive drum (1). Accordingly, V-shaped grooves (14) are formed on the surface of the vulcanized annular body around its circumference by the V-shaped grindstones (4) of the grinding wheel (3), thereby allowing a plurality of circumferentially extended compressed portions (8) of a belt to be formed on the surface of the vulcanized annular body. With the depth of the grooves being increased as the V-shaped groove forming process by the grinding wheel (3) progresses, the V-shaped projections (12) arranged on the positioning roller (11) which has been pressed on the surface of the vulcanized annular body in advance are engaged with the V-shaped grooves of the vulcanized annular body (10), thereby stopping the movement of the vulcanized annular body (10) immediately before the grinding wheel (3) to enhance the accuracy in grinding the V-shaped grooves (see Fig. 3).

Thus, as shown in Fig. 3, a combined belt (15) having a plurality of raw-edge V-belts combined together are obtained. This combined belt is then cut either simultaneously by a multi-blade cutter (16) whose blades are so arranged as to correspond to the groove pitch of a V-belt from the side of the V-shaped groove or sequentially by a single-blade cutter while moving the single-blade cutter along the length of the combined belt. Thus, a plurality of raw-edge V-belts (17) are produced, each of which incorporates the tension-resistant body (7) in the adhesive rubber (6) below which the compressed rubber portion (8) extends and on which the canvass with rubber portion (5) extends as shown in Fig. 4.

According to the present invention, a vulcanized annular body, which have been formed inside out and then vulcanized, is wound on two drums and revolved to grind grooves in V form on predetermined locations of the vulcanized annular body by a grinding wheel having a group of grindstones each having a V-shaped cross-section, and then cut the vulcanized annular body thus ground. As a result, no longer subject to angle deviations as observed in the conventional angle-cut system, the cutting accuracy is improved, and the grinding efficiency is also improved compared to the SCAM system. Further, it is possible to grind and cut a long size annular body with high accuracy only by changing the distance between the drums.

CLAIMS

1. A method of manufacturing raw-edge V-belts comprising the steps of:

- 5 forming an unvulcanized belt annular body inside out by winding respective components constituting the elongated portion, tension-resistant portion, and compressed portion of the belt in laminated form on the circumferential surface of a forming drum;
- 10 vulcanizing the unvulcanized belt annular body to obtain a vulcanized annular body;
- 15 revolving the vulcanized annular body by winding on a pair of drums consisting of a drive drum and an idle drum thereby to grind V-shaped grooves on the surface of the vulcanized annular body with a grinding wheel consisting of a group of grindstones whose cross-section is V shaped which is in pressured contact with one of the drive or the idle drum;
- 20 causing projections arranged on a positioning member which is capable of gradually increasing the depth of engagement to engage with the V-shaped grooves; and cutting the vulcanized annular body into bolts.
- 25 2. A method of manufacturing raw-edge V-belts, substantially as described with reference to the accompanying drawings.
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