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3,323,637

BELTING

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FIG. 1

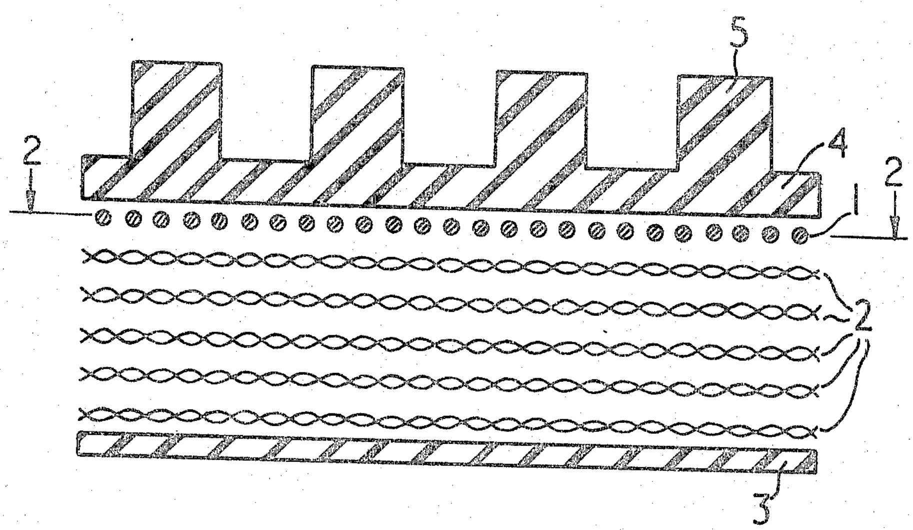
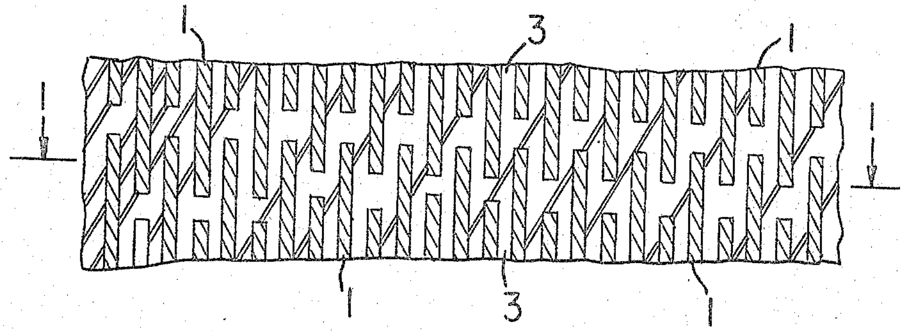


FIG. 2



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BELTING

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This invention relates to conveyor belting suitable for use in passenger-carrying roller-supported conveyor installations and in installations in which roller-supported belting is required to carry heavy loads, particularly in the latter case belting having a textile reinforcement of synthetic textile material.

According to the present invention, conveyor belting comprises a flexible composition having embedded therein a conventional reinforcement together with a layer of overlapping discrete lengths of substantially inextensible metal cords which lie in close side-by-side relationship substantially parallel with each other and with the longitudinal axis of the belting and are disposed in the belting between the conventional reinforcement and the load bearing surface of the belting. The metal cords increase the resistance to deformation under load of the belting but do not contribute to its tensile strength.

The exact nature of this invention and the advantages thereof will be readily apparent to those skilled in the art from the following description in conjunction with the accompanying drawings, in which:

FIGURE 1 shows a diagrammatic cross-section of a belting embodying the invention, and FIG. 2 is a plan view of a section of the belting along the line 2—2 of FIG. 1.

Referring now particularly to FIG. 1, the belting comprises a layer of substantially inextensible metallic cords **1** laid on top of a conventional reinforcement **2**, here shown as five plies of woven textile fabric. A lower, or bottom, cover layer **3** of suitable elastomer is applied to the outermost ply of the reinforcing fabric, and an upper or top layer **4** of elastomer covers the metal cords **1**. Top layer **4** is provided with a ribbed outer surface **5** of suitable design.

In FIG. 2, an arrangement of the metallic cords in over-lapping relationship is illustrated. It will be understood, of course, that neither this figure nor FIG. 1 is to scale and that the dimensions and spacings therein are chosen so as to emphasize the novel features of the invention.

The conventional reinforcement may be a reinforcement of textile material composed of natural and/or synthetic textile cords in woven or weftless arrangement or a reinforcement of extensible metal cords or a reinforcement of inextensible metal cords biased with respect to the longitudinal axis of the belting, or a reinforcement composed of a combination of any of the above materials and arrangements. The conventional reinforcement should not have an extensibility of substantially more than 1–2% at 10% of the load required to break the reinforcement.

The substantially-inextensible metal cords may suitably be steel cords which are normally composed of intertwisted strands of steel wire. The cords should have a percentage extensibility (or elongation at break) of less than 5 percent, preferably less than 2.5 percent but in practice often about 3.5 percent. The discrete lengths of cord will normally be greater than 6 inches in length, and may suitably be of the order of 4–6 ft. in length, the actual dimensions being determined by the size of the press used to consolidate the belting. In the press the belting will normally be stretched and it is desirable that

the metal cords should be discontinuous and overlapping at at least one point in the press so that the metal cords do not take the tensile strain on the belting. Each length of metal cord will normally have sufficient overlap with the succeeding length of metal cord to allow extension of the order of 2% without destroying the overlapping relationship. Each discrete length of metal cord should be sufficiently long so that the substantially inextensible na ture of the cord is preserved in any area under load. Suitable steel cords may be composed of from 6 to 24 strands of steel wire of about 0.005 to 0.010 inch diameter. The cords which are arranged in close side-by-side relationship may suitably be arranged across the belting at a frequency amounting to from 8 to 24 cords per inch. The cords may be spaced across the whole width of the belting, or they may be arranged near the edges of the belting only.

The flexible composition in which the reinforcement is embedded may be a vulcanized natural or synthetic rubber composition or a synthetic resin composition such as plasticised polyvinyl chloride composition.

The discrete lengths of substantially-inextensible steel cords may be prepared by plating the cords (e.g. by zinc plating) and arranging the plate cords in side-by-side relationship and applying a bonding flexible composition such as a natural rubber composition containing a minor proportion of a cobalt salt such as cobalt linoleate or cobalt naphthenate over and between the cords by a process of cold calendering. The ply of rubber-coated cords may then be included in the belting.

The belting is manufactured in one length and joined by splicing or the use of belt fasteners.

The load bearing surface of the belting will normally be formed by the flexible composition. The reverse surface of the belting may be formed by the flexible composition or by a textile material such as a hard cotton duct.

The belting in accordance with the present invention shows advantages over belting which has been used heretofore in installations in which the belting is supported by rollers, particularly in that the belting shows a high resistance to deformation by a load on the load bearing surface without the ability of the belting to pass around a pulley being impaired.

It is believed that this combination of properties is related to the disposition of the discrete length of substantially-inextensible cords between the conventional reinforcement and the load bearing surface. According to this theory, the layer of substantially-inextensible metal cords acts as a neutral layer in the belting. Thus a load placed on the load bearing surface can only deform the belting by extending the conventional reinforcement, which being under tension resists further extension, but nevertheless the belting will pass around a pulley because the conventional reinforcement between the cords and the pulley is easily compressed in a circumferential direction. If the conventional reinforcement were disposed between the substantially-intensible cords and the load bearing surface, it would be necessary for the textile material to be extensible in a circumferential direction as the belting passed around the pulley, and such extension would require considerable force.

Thus in passenger-carrying conveyor installations in which passenger-carrying conveyor belting is supported on a bed of transverse rollers, the belting in accordance with this invention has less tendency to "dipping" under load between the rollers than belting which has been used heretofore, and so a smoother and more level ride for the passenger results. Nevertheless, the belting passes smoothly around the end pulleys. In this application the belting normally contains a layer of substantially-inextensible metal cords spaced across the whole width of the belting.

Similarly, in conveyor installations in which belting required to carry heavy loads is supported on troughing rollers, the belting in accordance with the present invention has advantages over belting used heretofore in that it has increased resistance to sagging outwards between the side troughing rollers. In this application the belting will normally contain a layer of substantially-inextensible cords at the edges of the belting only which is the area where sagging is likely to occur. For example, the layer of substantially-inextensible cords may be spaced across about 6 to 9 inches adjacent to the edges of the belting.

The construction of a passenger-carrying conveyor belt will now be described by way of example.

5 plies of conventional 42 oz. belting duck of woven cotton were frictioned on both sides of each ply with a natural rubber composition, and the plies were calendered together.

Substantially-inextensible steel cords (2 x 3 x 0.0086 inch steel wire, zinc plated) were laid in side-by-side relationship in 6 ft. lengths at a frequency of 20 cords per inch. A rubber composition containing a minor proportion of cobalt linoleate was applied over and between the cords by cold calendering. The rubberised steel cords were laid on top of the 5 plies of cotton duck so that each 6 ft. length was overlapping the end of the succeeding 6 ft. length. A bottom cover layer of a natural rubber composition $\frac{1}{16}$ inch thick was applied to the bottom of the plies of cotton duck. A top cover layer of a natural rubber composition $\frac{1}{8}$ inch thick was applied over the ply of rubberised steel cords and a ribbed surface was applied to the top of the top cover layer. The ribs running longitudinally along the belt were $\frac{1}{4}$ inch wide and $\frac{1}{4}$ inch high with a $\frac{1}{4}$ inch groove between adjacent ribs.

The belt was vulcanized and the ends spliced to form an endless belt.

This belt was laid on a bed of 3 inch diameter rollers having axes $3\frac{1}{2}$ inches apart, and a smooth level ride for passengers standing on the belt was obtained.

Having now described my invention, what I claim is:

1. In a conveyor belting comprising a flexible composition body portion and conventional reinforcement embedded therein, the improvement which comprises a plurality of overlapping discrete lengths of substantially inextensible metal cords embedded in said body portion between said reinforcement and the load-bearing surface of the belting, said metal cords being from four to six feet in length and formed of a plurality of intertwisted strands of metal wire of 0.005 to 0.010 inch diameter, whereby the resistance of said belting to sagging under load is substantially increased.

2. A sag-resistant conveyor belting as defined in claim 1 wherein the metal cords are spaced laterally in side-by-side relationship parallel to the longitudinal axis of said belting at a frequency of from eight to twenty-four cords per inch.

3. In a conveyor belting comprising a body of substantially flat configuration having a longitudinal dimension greater than its transverse dimension and two principal surfaces, one of which is a bottom surface suitable for passage over roller supports, and the other of which is a load-bearing surface, said body comprising a flexible composition and a conventional textile belting reinforcement embedded in said flexible composition, the improvement comprising a layer of overlapping discrete lengths of substantially inextensible steel cords embedded in said flexible composition in close side-by-side relationship substantially parallel to each other and to the longitudinal axis of the belting and disposed between the conventional reinforcement and the load-bearing surface of the belting, said cords being formed of from four to six intertwisted strands of 0.005 to 0.010 inch diameter steel wire.

4. Conveyor belting as defined in claim 3 wherein the textile reinforcement is comprised of woven cotton fabric.

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