COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1973

APPLICATION FOR A PATENT

We CONTINENTAL AKTIENGESELLSCHAFT

of Königsworther Platz 1, 3000 HANNOVER, GERMANY

hereby apply for the grant of a Patent for an invention entitled:

JOIN FOR CONVEYOR BELTS OR POWER-TRANSMISSION BELTS

which is described in the accompanying complete specification. This Application is a Convention Application and is based on the Application numbered: P 40 04 784.9 for a Patent or similar protection made in Germany on 16 February 1990.

Our address for service is:

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DATED this 12th day of February 1991

CONTINENTAL AKTIENGESELLSCHAFT
By their Patent Attorney

GRIFFITH HACK & CO

TO: THE COMMISSIONER OF PATENTS
COMMONWEALTH OF AUSTRALIA
DECLARATION IN SUPPORT OF AN APPLICATION FOR A PATENT

In support of an application made by:

CONTINENTAL AKTIENGESELLSCHAFT

for a patent for an invention entitled: JOIN FOR CONVEYOR BELTS OR POWER-TRANSMISSION BELTS

XXX We, Egon Schneider & Rolf Sommerfeld
of Zur Wedderling 8, D-3008 Garbsen 2 GERMANY
Domagkweg 33, 3000 Hannover 61 GERMANY respectively.

do solemnly and sincerely declare as follows:

1. I am authorised by the above mentioned applicant for the patent to make this declaration on its behalf.

2. The name and address of each actual inventor of the invention is as follows:
   Dr. Alles, Rainer
   Isernhagener Str. 7, 3004 Isernhagen

3. The facts upon which the applicant is entitled to make this application are as follows:
   The applicant is the assignee of the said invention from the actual inventor.

4. The basic application(s) as defined by Section 141 of the Act was (were) made as follows:
   Country Federal Republic of GERMANY on 16 February 1990
   in the name(s) Continental Aktiengesellschaft
   and in on
   in the name(s)

5. The basic application(s) referred to in the preceding paragraph was (were) the first application(s) made in a Convention country in respect of the invention the subject of this application.

Declared at Hannover,
this 18th day of January 1990
Signed
(Schneider) (Sommerfeld)
Position Patent Managers

GRIFFITH HACK & CO
PATENT AND TRADE MARK ATTORNEYS
MELBOURNE · SYDNEY · PERTH
(19) AUSTRALIAN PATENT OFFICE

(54) Title
JOIN FOR CONVEYOR BELTS OR POWER-TRANSMISSION BELTS

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(57) Claim

1. Join between two end portions of a conveyor belt or power-transmission belt, which is formed from elastomeric material and includes a tension carrier, which is embedded between covering layers and is formed from textile or metallic material, having the following features:

a) the free ends of the tension carriers are placed together at a point of connection;

b) the point of connection between the tension carriers is covered by a reinforcing member, which is embedded in elastomeric material; and

c) the reinforcing member comprises a covering fabric or filaments or wires, which are orientated transversely or substantially transversely relative to the tension carriers;

characterised by the following feature:

d) each reinforcing member is interrupted in the region of the free ends of the tension carriers.
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Substitute Complete Specification

(Original)

For Office Use

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To Be Completed By Applicant

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Complete Specification for the invention entitled:

JOIN FOR CONVEYOR BELTS OR POWER-TRANSMISSION BELTS

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

GH&CO REF: 4771-AN:CLC:RK
DESCRIPTION

JOIN FOR CONVEYOR BELTS OR POWER-TRANSMISSION BELTS

The invention relates to a join between two end portions of a conveyor belt or a power-transmission belt formed from elastomeric material, in accordance with the preamble of claim 1.

The tension carrier, which is embedded in the conveyor belts or power-transmission belts, seeks to transmit the forces which are introduced at the driving means. The tension carrier is formed from one fabric ply, or respectively from a plurality of fabric plies which are situated one above the other, in the fabric-reinforced belt or strap. In the case of a steel rope belt, the tension carrier is formed from steel ropes, which are situated in one plane and extend parallel to one another in the longitudinal direction, such steel ropes being embedded in core rubber. Instead of the steel ropes, the tension carrier may also comprise other filamentary reinforcing members.

In most cases, for the endless closure of an open belt or strap and for the joining together of a plurality of partial lengths, joins are produced by vulcanisation, wherein the tensile forces of the belts are transmitted from one reinforcing member to the other as a result of shearing stresses in the rubber.
The free ends of the tension carrier are placed together at the point of connection. In such case, individual plies or ropes of the tension carrier may be placed one in front of the other in an obtuse manner or may lie freely above or between the tension carrier of the other belt end in an overlapping or encased disposition. In each case, the ends of the tension carrier are freely embedded in the surrounding elastomeric material.

At the point of connection, the tensile forces of one tension carrier are transmitted to the other tension carrier by the layers of rubber disposed therebetween. The forces occur in the form of a shearing force.

In the case of wire rope conveyor belts, the forces are transmitted from the rope of one belt end to the rope of the other belt end via the layer of rubber, which lies therebetween and may not be below a minimum thickness.

For the transmission of greater tensile forces, high-strength conveyor belts are used, the point of connection between such belts having a multiple-stepped form.

In order to protect the conveyor belt from becoming damaged or destroyed, the conveyor belts are provided with an insert ply, which is usually inserted between the belt core and the upper and/or lower covering layer and serves to protect the belt from being cut and pierced, which insert ply is in the form of a reinforcing member, which comprises steel ropes or similar filamentary structures and extends over the entire width of the belt in a straight line either
inclinedly or transversely relative to the longitudinal direction of the conveyor belt, apart from some narrow edge zones. This protective transverse reinforcement must also extend into the point of connection of the conveyor belt.

It is also known to provide transverse reinforcement solely at the point of connection of a belt or strap which is otherwise not transversely reinforced. In such case, the transverse reinforcement serves to increase the resistance to shearing in the connection region.

A join between the abutting end portions of a conveyor belt or power-transmission belt, which is formed from rubber or rubber-like plastics materials, is known from DE-PS 25 11 671, where a transverse reinforcement is provided, which comprises a reinforcing member formed from parallel filaments or wires with spacings therebetween, the filaments or wires extending transversely or substantially transversely relative to the tension carrier. The transversely extending cord filaments have the narrowest spacings in the central region of the join, and such spacings become increasingly greater towards the end regions in both directions. The entire length of the join is covered with this transverse reinforcement.

To produce joins for steel rope conveyor belts, it is stipulated, according to DIN 22129, Part 4, that a transverse reinforcement at the supporting end should also be introduced into the region of the join when the transverse reinforcement extends over the entire length of the conveyor belt. However, for mechanical reasons, a small spacing of about 50 mm has
to be maintained from the transitional zones, in which the cover plates are inclined towards the core of the belt.

It is well known that the weakest point of a conveyor belt is its join. The endurance of the belt is limited by the dynamic durability of the join.

It has been ascertained that the join begins to work loose at the free ends of the two ends of the tension carrier. In the case of a wire rope conveyor belt, this separation may cause the wire rope ends to work loose. In consequence, the elastomeric material at the free ends of the tension carrier proves to be the weakest part of the join, even when the force transmitted there is very small compared with the individual tensile forces in the tension carrier. This is because shearing stresses occur at the free ends in the elastomeric material, and such stresses are proportional to the tensile stresses. The high shearing stress of the elastomeric material at the free ends is the reason why the belt possibly begins to work loose there.

In order to reduce the shearing stresses in the join and to increase the dynamic strength, it is known to increase the spacings between the tension carriers by means of special layouts. Transverse reinforcements, which are also provided, contribute towards the reduction, because they increase the resistance to shearing. However, it is still necessary to effect a further increase in the dynamic strength of the join.
The basic object of the invention is to increase the dynamic strength of the join between conveyor belts or power-transmission belts.

According to the invention, the object is achieved, in that each reinforcing member is interrupted in the region of the free ends of the tension carriers.

The transverse reinforcement is interrupted at the tension carriers which terminate freely at the point of connection. It was surprisingly ascertained that, as a result of this measure, the dynamic strength of the join is considerably increased. The possibility of the free ends of the tension carrier working loose was further minimised. This advantageous effect arises because the probability of disturbances occurring at the free ends of the tension carriers to be joined is reduced, because a greater volume of rubber is available for the shearing deformations. As a result of this greater volume of rubber, the shearing stresses at the ends of the tension carriers become smaller, such ends representing the critical locations in a join between belts or straps.

The cover plate volume is available at the free ends, with the result that any shearing deformations which occur can spread-out in the rubber. Due to the relatively small shearing angle which is achieved, stress peaks are avoided in the region of the free ends.

In an advantageous embodiment of the invention, the interrupted portion of the reinforcing member extends over the entire width of the belt or
strap. The means for establishing the join is thereby distinguished for its simplicity.

In a further, advantageous embodiment of the invention, the reinforcing member has window-like interruptions in the region of the free ends of the tension carriers. This embodiment is advantageous for reinforcing members in the connection region, which members are formed from a fabric web.

Further embodiments of the invention are described in claims 4 and 5.

As a result of the invention, the dynamic durability of a conveyor belt or power-transmission belt is increased, whilst a good tensile strength is also maintained.

Three embodiments of the invention are explained more fully hereinafter with reference to the drawing. In the drawing:

Fig. 1 illustrates two-stage join of a wire rope conveyor belt;

Fig. 2 is a side elevational view, in longitudinal sectional form, of a finger-type spliced join of a textile conveyor belt;

Fig. 3 is a plan view of the textile conveyor belt of Fig. 2, with the outer rubber covering layer removed; and
Fig. 4 illustrates a two-stage join of a wire rope conveyor belt, with a covering fabric serving as the reinforcing member.

In the join shown in Fig. 1, the wire ropes 11 and 12 of two conveyor belt ends 13 and 14 respectively are placed one inside the other in a step-like manner. After the ropes 11 and 12 have been placed adjacent each other so as to be continuous from the left and right belt ends 13 and 14, the next, corresponding pair of ropes are so cut-off that such ropes abut against one another in the centre of the join. In the join shown, the free ends 15 and 16 of the wire ropes 11 and 12 are situated in three regions 17, 18 and 19, which extend transversely relative to the width of the belt.

Transverse reinforcing members 21 and 22, formed from filaments 23, are inserted in the join between the regions 17, 18 and 19 of the free ends 15 and 16 of the wire ropes 11 and 12, and such reinforcing members are vulcanised into the upper connecting cover plate, which is not shown here, transversely relative to the wire ropes 11 and 12. The filaments 23 may be inserted as single filaments or be combined by means of connecting filaments. The filaments 23 may also be formed from metallic material. The regions 17, 18 and 19 of the free ends 15 and 16 remain uncovered by the transverse reinforcing members 21 and 22.

The textile conveyor belt, which is illustrated in Figs. 2 and 3, has a tension carrier formed from a textile fabric web 31. The free ends 32 and 33 of the two tension carrier ends to be connected are cut to size in an appropriately pointed manner and
are placed one inside the other in a finger-like spliced join 34.

Each side of the point of connection is covered by a thin layer of core rubber 35 and 36 respectively. A transverse reinforcing member, formed from an applied fabric ply 37, e.g. a mesh-type fabric, is provided on each of these layers of core rubber 35 and 36. The fabric plies 37, which are provided on each side, are covered by outer rubber plates 38 and 39, which terminate in respect of their height flush with the surfaces of the cover plates 41 and 42 of the conveyor belt.

The transversely reinforcing fabric plies 37 extend between the pointed ends 32 and 33 of the tension carrier 31 and leave the two regions of the free ends 32 and 33 of the tension carrier 31 uncovered. Adjustment strips 43, formed from rubber, are laterally inserted into the connection adjacent the fabric plies 37.

The embodiment of a join of a steel rope conveyor belt shown in Fig. 4 has a fabric ply 53, which is disposed above the steel ropes 51 and 52 and is embedded in core rubber, such ply leaving the left and right regions 54 and 55 of the free ends 56 and 57 of the steel ropes 51 and 52 uncovered. In the central region 58 of the join, a few wire rope ends 56 and 57 are in contact with one another, with the required spacing from one another. The fabric ply 53 is cut-out in a window-like manner in the region of these points of contact and also leaves these contact regions 59 uncovered.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Join between two end portions of a conveyor belt or power-transmission belt, which is formed from elastomeric material and includes a tension carrier, which is embedded between covering layers and is formed from textile or metallic material, having the following features:

a) the free ends of the tension carriers are placed together at a point of connection;

b) the point of connection between the tension carriers is covered by a reinforcing member, which is embedded in elastomeric material; and

c) the reinforcing member comprises a covering fabric or filaments or wires, which are orientated transversely or substantially transversely relative to the tension carriers;

   characterised by the following feature:

   d) each reinforcing member is interrupted in the region of the free ends of the tension carriers.

2. Join according to claim 1, characterised in that the interrupted region of the reinforcing member extends over the entire width of the belt or strap.
3. Join according to claim 1, characterised in that the reinforcing member has window-like interruptions in the region of the free ends of the tension carriers.

4. Join according to claim 1 or 2, characterised in that the reinforcing member is formed from textile or metallic cords, which extend substantially transversely relative to the tension carriers.

5. Join according to one of claims 1 to 3, characterised in that the reinforcing members are formed from a fabric ply.

6. A join substantially as hereinbefore described with reference to the accompanying drawings.

Dated this 12th day of February 1991

CONTINENTAL AKTIENGESELLSCHAFT
By their Patent Attorney
GRIFFITH HACK & CO.
FIG. 2

FIG. 3