CPC field-specific training

F16G "Belts"
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Introduction

F16G

The subclass F16G deals with:

- BELTS, CABLES, OR ROPES PREDOMINANTLY USED FOR DRIVING PURPOSES;
- CHAINS;
- FITTINGS PREDOMINANTLY USED THEREFOR
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What and where to classify F16G
Subclass F16G

F16G contains: **elements specially adapted for transferring power/force from an input point to an output point to move or drive at least one mechanical part.**

These elements can be:

- **Belts**: to be classified F16G1/00, 
  BUT conveyor belts are classified in B65G.

- **V-belts** (force being transmitted by the side surface of the belt): to be classified in F16G5/00 and subgroups.

- **Ropes or cables** adapted for driving: to be classified in F16G9/00 and subgroups **BUT cables or ropes in general are classified in D07B.**

- **Chains**: to be classified in F16G13/00 and subgroups.
What and where to classify F16G

Subclass F16G

F16G also contains the junction for these elements:

- **Junction of belt**: to be classified in group F16G3/00 and subgroups.
- **Junction of V-belt**: to be classified in group F16G7/00 and subgroups.
- **Attachment of ropes or cables**: to be classified in group F16G11/00 and subgroups.
- **Chain couplings**: to be classified in group F16G15/00 and subgroups.
F16G does not cover

- **Conveyor belts**: see B65G except for the junction of conveyor belts which are classified under F16G3/00

- **Ropes and cables in general**: see D07B.
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  - **Overall structure F16G1**
- Overall structure F16G5
Overall structure F16G1
F16G1/00: driving belts

- The main group F16G1/00 and subgroups deal with driving belts, which can be e.g. flat belts or toothed belts, and which are designed to transfer power(force) from an input point to an output point to move or drive at least one mechanical part.
- Conveyor belts are not classified under F16G but under B65G.
- V-Belt are not classified under F16G1/00 but under F16G5/00.

- The belts are either
  - formed into a loop that is intended to travel around an endless path and engage two or more pulleys, sprockets or similar rotating elements and transfer power(force) while travelling along its path;
  - or an elongated element that is intended to travel backward or forward along a path to transfer power(force) between one point along its length to another point along its length, e.g. from a drum to a load.
Overall structure F16G1
F16G1/00: the structure

The subgroups of F16G1/00 are essentially dealing with the different materials used to make the belt, or how they are built:

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F16G1/02</td>
<td>made of <strong>leather</strong></td>
</tr>
<tr>
<td>F16G1/04</td>
<td>made of <strong>fibrous</strong> material, e.g. textiles, whether rubber-covered or not</td>
</tr>
<tr>
<td>F16G1/06-F16G1/12</td>
<td>made of <strong>rubber</strong></td>
</tr>
<tr>
<td>F16G1/14-F16G1/16</td>
<td>made of <strong>plastics</strong></td>
</tr>
<tr>
<td>F16G1/18</td>
<td>made of wire</td>
</tr>
<tr>
<td>F16G1/20</td>
<td>made of a single metal strip</td>
</tr>
<tr>
<td>F16G1/21</td>
<td>built-in from superimposed layers, e.g. zig-zag folded</td>
</tr>
<tr>
<td>F16G1/22</td>
<td>consisting of several parts</td>
</tr>
<tr>
<td>F16G1/28</td>
<td>with a contact surface of <strong>special shape</strong>, e.g. toothed</td>
</tr>
</tbody>
</table>
Overall structure F16G1
F16G1/06-F16G1/12: rubber driving belts

- The more common subgroups of F16G1/00 used are F16G1/06 and subgroups dealing with belts made with rubber.

- **Some examples of rubber commonly used:**
  polymer containing dienes (see main groups C08L7/00-C08L21/00 and depending lower groups), e.g. HNBR, CR, acrylonitrile butadiene rubber ("NBR"), styrene-butadiene rubber ("SBR"), alkylated chlorosulfonated polyethylene ("ACSM"), epichlorohydrin, butadiene rubber ("BR"), natural rubber ("NR"), ethylene alpha olefin elastomers, ethylene propylene terpolymer or ethylene propylene diene terpolymer ("EPDM"), ethylene propylenecopolymer ("EPM")
Overall structure F16G1
F16G1/06-F16G1/12: rubber driving belts

- The subgroups of F16G1/08 deal with the reinforcement of the rubber.
- If the reinforcement is made of textile F16G1/10 is used.
- If the reinforcement is made of metal (wires) F16G1/12 is used.

- The reinforcement can be used:
  - for external use on the outer or inner layer of the belt: see layer 19 and 20 in WO2011003090
  - or internally see inserts 20 of US3911755.

- GB2026940 contains metal wires and is classified in F16G11/12.
Overall structure F16G1
F16G1/14-F16G1/16: plastic driving belts

- The subgroups F16G1/14 and F16G1/16 deal with belts made of plastics.

- Some examples of plastics commonly used:
  Polyester (PES), Polyethylene terephthalate (PET), Polyethylene (PE), High density polyethylene (HDPE), Polyvinyl chloride (PVC), Polyvinylidene chloride (PVDC), Low-density polyethylene (LDPE), Polypropylene (PP), Polystyrene (PS), High impact polystyrene (HIPS), Polyamides (PA) (Nylons), Acrylonitrile butadiene styrene (ABS), Polycarbonate (PC), Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS), Polyurethanes (PU).
Overall structure F16G1
F16G1/14-F16G1/16: plastic driving belts

- The subgroups of F16G1/16 deal with the reinforcement of the plastics.

- see WO2007054065 which discloses a belt made of thermoplastics and is therefore classified in F16G1/16.
Overall structure F16G1
F16G1/28: belts with a contact surface of special shape

- The subgroups of F16G1/28 deal with belts having a contact surface of special shape, e.g. toothed belts.

- see US2010120566.
Overall structure F16G1

Other examples of belts classified in F16G1/00

- F16G1/20: made of a **single metal strip**, see e.g. EP0428280

- F16G1/21: 7 built-in from **superimposed layers**, e.g. zig-zag folded, see e.g. US2004219850

- F16G1/22: consisting of **several parts**, see e.g. EP2116487
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- **Overall structure F16G5**
Overall structure F16G5

F16G5/00: V-belts, i.e. belts of tapered cross-section

- The main group F16G5/00 and subgroups deal with **V-belts** adapted for **transferring power/force from an input point to an output point** to move or drive at least one mechanical part.

- The **V-belts** are either
  - formed into a loop that is intended to travel around an endless path and engage two or more pulleys, sprockets or similar rotating elements and transfer power/force while travelling along its path;
  - or an elongated element that is intended to travel backward or forward along a path to transfer power/force between one point along its length to another point along its length, e.g. from a drum to a load.

- The transfer of power/force is mostly done by the **side surfaces** of the V-belt.
F16G5/00: the structure

The subgroups of F16G5/00 are essentially dealing with the different materials used to make the V-belt, or how they are built:

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>F16G5/02</td>
<td>made of leather</td>
</tr>
<tr>
<td>F16G5/04-F16G5/10</td>
<td>made of rubber</td>
</tr>
<tr>
<td>F16G5/12-F16G5/14</td>
<td>made of plastics</td>
</tr>
<tr>
<td>F16G5/16</td>
<td>consisting of several parts</td>
</tr>
<tr>
<td>F16G5/20</td>
<td>with a contact surface of special shape, e.g. toothed</td>
</tr>
<tr>
<td>F16G5/22</td>
<td>built-up from superimposed layers</td>
</tr>
</tbody>
</table>
Overall structure F16G5
F16G5/04-F16G5/10: rubber V-belts

- The more common subgroups of F16G5/00 used are F16G1/04 and subgroups dealing with V-belts made with rubber.

- Some examples of rubber commonly used:
  polymer containing dienes (see main groups C08L7/00-C08L21/00 and depending lower groups), e.g. HNBR, CR, acrylonitrile butadiene rubber ("NBR"), styrene-butadiene rubber ("SBR"), alkylated chlorosulfonated polyethylene ("ACSM"), epichlorohydrin, butadiene rubber ("BR"), natural rubber ("NR"), ethylene alpha olefin elastomers, ethylene propylene terpolymer or ethylene propylene diene terpolymer ("EPDM"), ethylene propylenecopolymer ("EPM"),
Overall structure F16G5
F16G5/04-F16G5/10: rubber V-belts

- The subgroups of F16G5/06 deal with the reinforcement of the rubber.
- If the reinforcement is made of textile F16G5/08 is used.
- If the reinforcement is made of metal (wires) F16G5/10 is used.

- The reinforcement can be used:
  - for external use on the inner or outer surfaces of the V-belt: see layer 24 in EP1739124
  - or internally see inserts 26 in EP1739124
Overall structure F16G5
F16G5/12-F16G5/14: plastics V-belts

- The subgroups F16G1/12 and F16G1/14 deal with V-belts made with plastics.

- Some examples of plastics commonly used:
  Polyester (PES), Polyethylene terephthalate (PET), Polyethylene (PE), High density polyethylene (HDPE), Polyvinyl chloride (PVC), Polyvinylidene chloride (PVDC), Low-density polyethylene (LDPE), Polypropylene (PP), Polystyrene (PS), High impact polystyrene (HIPS), Polyamides (PA) (Nylons), Acrylonitrile butadiene styrene (ABS), Polycarbonate (PC), Polycarbonate/Acrylonitrile Butadiene Styrene (PC/ABS), Polyurethanes (PU).
Overall structure F16G5
F16G5/16: V-belt consisting of several parts

- In F16G5/16 are classified metallic CVT belts, see US2010144474. These belts are provided with a metallic ring made of several concentric rings on which a plurality of transverse elements are sliding. These elements are engaging a pulley with their lateral sides.

- If the metallic CVT belt is provided with some means to allow lubrication, then the lower group F16G5/163 should be given.
Overall structure F16G5
F16G5/166: V-Belts consisting of several parts with non metallic rings

In F16G5/166 are classified CVT belts with a ring, more often made of rubber, see WO2010061564. On the non metallic endless loop(s), a plurality of transverse elements made more often of reinforced resin are attached such that they can not slide on the loops. These elements are engaging a pulley with their lateral sides.
Overall structure F16G5
F16G5/18: V-belts constituted of several parts in form of links

In F16G 5/18 are classified the CVT chains (!). This is mainly because these chains behave like a V-belt as all the force/power is transmitted from the pulley to the chain by the end of the protruding rocker pins (here 14 and 19 in are EP1748221), i.e. by the side surfaces of the chain.
Overall structure F16G5
F16G5/20: V-belts with a contact surface of special shape, e.g. toothed

- In F16G5/20 are classified the **toothed V-belts** and in particular the **multi-ribbed** belts or **poly V-belt**. Here (WO2010047051) the crests are arranged along the circumferential direction of the loop.

- The teeth can also be provided in the transversal direction, as in a normal toothed belt.