

- [54] **V-BELT FOR A STEPLESS VARIABLE
ASYMMETRIC V-BELT DRIVING GEAR**
- [75] Inventor: **Friedrich Moogk**, Sinn, Germany
- [73] Assignee: **Emil and Adolf Becker KG**, Sinn,
Germany
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- [51] Int. Cl. **F16g 5/00**
- [58] Field of Search..... **74/234, 237, 230.17 A**

[56] **References Cited**

UNITED STATES PATENTS

- 3,656,359 4/1972 Dorf et al. 74/234

3,365,967 1/1968 Moogk..... 74/230.17 A

Primary Examiner—Leonard H. Gerin

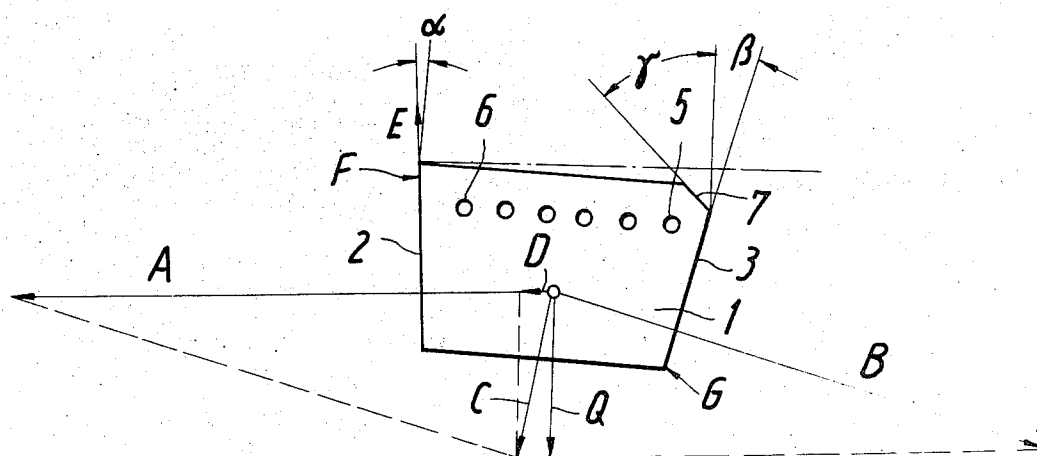
Attorney—Hane, Baxley & Spiezens

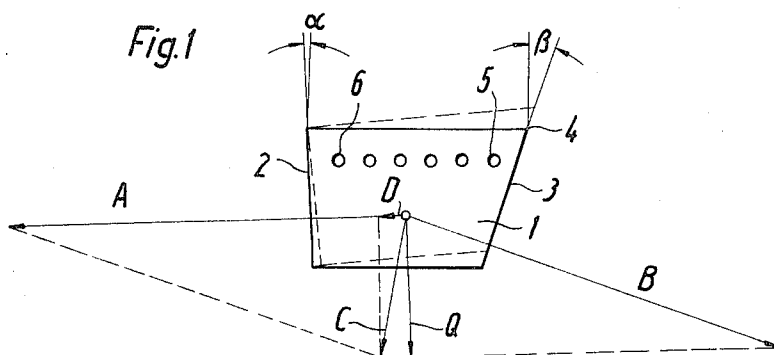
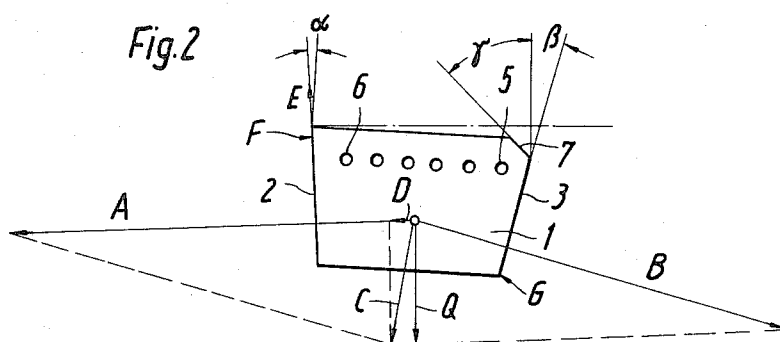
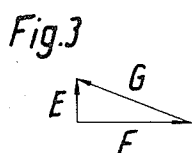
[57] ABSTRACT

It is the object of the invention to provide a V-belt in such a manner that at higher rate of power input the V-belt will have longer life-time.

It was found that this object is met if the flank of the V-belt associated with the almost vertical side flank is inclined by at least 1° more than this side flank; and if the flank of the V-belt associated with the inclined side flank is inclined by at least 1° less than this side flank.

5 Claims, 3 Drawing Figures





V-BELT FOR A STEPLESS VARIABLE ASYMMETRIC V-BELT DRIVING GEAR

The present invention relates to a V-belt for asymmetric V-belt pulleys, the one side flank of which runs nearly at right angle to the axis of the pulley and the other side flank of which runs at an inclined angle to the axis of the pulley. Asymmetric pulleys of this type are disclosed, for instance, in applicant's prior U.S. Pat. No. 3,365,967, issued Jan. 30, 1968.

A known V-belt of the above manner is described in applicant's older U.S. Pat. No. 3,365,967, wherein with an angle $\alpha = 19^\circ$ of the inclined flank of the V-belt, the corresponding angle of the belt is $19^\circ - 20^\circ$.

The angle at this side of the V-belt is in this case by less than 1° greater than the corresponding angle of the side flank of the pulley half.

It is the object of the invention to provide a V-belt in such a manner that at higher rate of power input the V-belt will have longer life-time.

Now, we have found that this object is met if the flank of the V-belt associated to the almost vertical side flank is inclined by at least 1° more than this side flank; and if the flank of the V-belt associated to the inclined side flank is inclined by at least 1° less than this side flank. These angles refer to a plane perpendicular to the axis of the pulley.

A further improvement of the V-belt according to this invention results from the fact that with an inclination of the almost perpendicular side flank of the pulley of about 1° to 2° relative to the vertical plane of reference, the associated flank of the V-belt is inclined by about 3° to 5° relative to the plane of reference, and that the other flank of the V-belt is inclined by about 15° to 17° relative to the plane of reference.

As compared to the known V-belt, the abovementioned angular difference of the V-belt of the present invention is not only merely inversed, but there is further provided for an angular difference at the side of the almost vertical side flank.

By applying the features of the present invention, it is avoided that with short-time loads the V-belt starts a unilateral sloping run as a consequence of unilateral stretching of the cord filaments at the side of the greater flank angle. This disadvantage was observed particularly during the first full-load running hours and especially with stepless variable driving gears having an automatic and load-dependent tension of the belt. The result of this was the premature wear of the belt as well as a reduction of the load to be transmitted.

It is the effect of the features of the present invention that, at full-load, all the cord filaments are uniformly elongated or stretched, one after the other, and that during further running, the tension stays almost constant so that the flanks of the V-belt fully contact the conical contact surfaces of the pulley sections and thus the maximum power can be transmitted.

An exemplary embodiment of the present invention is illustrated in the accompanying drawings. In these drawings:

FIG. 1 shows schematically the forces acting at the cross-section of an asymmetric belt;

FIG. 2 shows schematically the forces occurring at the cross-section of a belt of the invention;

FIG. 3 shows the parallelogram of forces of FIG. 2.

It is known that all V-belts of any profile tension or elongate during the initial full-load running hours. In

order to reduce this initial tension, the cord filaments have up to now been reinforced by glass fibres, but it must still be reckoned with a certain initial tension. Particularly the cord filaments 5 (FIG. 1) at the profile side having the greater flank angle are more exposed to this initial tension, the consequence of which has been until now that V-belt 1—especially at a short-time overload—was running obliquely, seen in profile (see dotted line in FIG. 1).

In order to elongate or stretch all cord filaments one after another and quite equally during the running period, especially during the initial ten full-load running hours, the flank angles of asymmetric V-belt 1 are dimensioned in such a way that in the first few hours the belt is forced into an inversed sloping position (FIG. 2). This is obtained in making the flank angle α , depending on the load of the V-belt, greater by at least 1° to 3° than the associated angle of the conical pulley, which angle is known to be 1° to 2° because of the low-frictional inlet or outlet of the V-belt. Therefore flank angle α would be made 3° to 5° . Flank angle β , however, must be made 1° to 3° smaller than the angle of the other conical pulley, which is 18° to 19° . Flank angle β must therefore be about 18° to 15° .

As a consequence of the in itself over-dimensioned flank angles of the asymmetric V-belt according to the present invention, axial load Q acting during the operation will produce a force component E (see FIGS. 2 and 3) as a result of side forces F and G appearing in this event. Thus force component E forces the V-belt into a sloping position according to FIG. 2, because force component E works against force component D.

During this operation, at first the lateral cord filaments 6, then the central and after that the lateral cord filaments at 5 are equally tensioned until a constant tension will be reached corresponding to the value of the load transmission or of the axial load Q respectively. A sloping of the V-belt towards 5, as shown in FIG. 1, does not occur, except that there appears an unduly large tensile stress resulting from an extreme over-load of the V-belt. Practical comparative experiments have shown that the loading capacity of this V-belt having the new flank angles α and β is increased by 20 to 30 percent over the loading capacity of the asymmetric V-belts having the known flank angles and/or, respectively, that their life-time is extended correspondingly.

When after the first ten full-load running hours the tensioning has been achieved, asymmetric V-belt is running in the slot completely straightly. After further running hours, flanks 2, 3 of the V-belt come into full contact with the contact surfaces of the pulley sections, too, because all known V-belts form their own flank angles after having run in.

The action of forces according to FIGS. 2 and 3 still can considerably be increased by providing at the flank 3 of the V-belt a chamfering means in the form of a plate 7 of 2 - 4 mm, having an angle γ of about 10° - 40° . A further advantage of providing this plate is a very smooth running of the asymmetric V-belt (no squeaking).

This plate 7 also increases in importance in extreme running instances when due to overload the asymmetric V-belt shows the tendency to slope towards the (dotted position in FIG. 1 because all belts, according to experience flat belts, always have the tendency on spherical pulleys, to run to the highest point.

What is claimed is:

1. An asymmetric V-belt for an asymmetric pulley having a first belt-contacting flank defining a plane nearly normal to the axis of the pulley and a second belt-contacting flank defining a larger angle relative to a plane normal to the axis of the pulley than the first flank, said V-belt comprising:
- a first side flank for contacting the first flank of the pulley and a second side flank for contacting the second flank of the pulley, said first flank of the belt defining an angle at least one-half degree larger relative to a plane normal to the pulley axis than the first flank of the pulley and the second flank of the belt defining an angle at least one-half degree smaller relative to a plane normal to the pulley axis than the second flank of the pulley; and a top surface and a base surface joining said side flanks of the belt.
2. The V-belt according to claim 1 for a pulley having a first belt-contacting flank defining an angle of one to

two degrees relative to a plane normal to the pulley axis, and wherein said first side flank of the belt defines an angle of about two to five degrees relative to a plane normal to the pulley axis and said second side flank of the belt defines an angle of twelve to twenty-seven degrees relative to a plane normal to the pulley axis.

3. The V-belt according to claim 2 wherein said second side flank of the belt and said top surface are joined by a chamfering means defining an angle relative to a plane which is normal to the axis of the pulley and intersects the junction between said chamfering means and said second side flank of the belt.

4. The V-belt according to claim 3 wherein said angle defined by the chamfering means is between ten to forty degrees.

5. The V-belt according to claim 3 wherein said chamfering means comprises a flat plate having a thickness of two to four millimeters.

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